USER'S MANUAL

DSO-3000(A) Series

4CH PC Based Digital Oscilloscope

V1.0.2

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General Safety Summary

Review the following safety precautions carefully before operate the device to avoid any personal injuries or damages to the device and any products connected to it.
To avoid potential hazards use the device as specified by this user's guide only.

◆**To Avoid Fire or Personal Injury**

◆**Use Proper Power Cord.** Use only the power cord specified for this product and certified for the country of use.

◆**Connect and Disconnect Properly.** Do not connect or disconnect probes or test leads while they are connected to a voltage source.

◆**Connect and Disconnect Properly.** Connect the probe output to the measurement device before connecting the probe to the circuit under test. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement device.

◆**Observe All Terminal Ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

◆**Use Proper Probe.** To avoid shock hazard, use a properly rated probe for your measurement.

◆**Avoid Circuit or Wire Exposure.** Do not touch exposed connections and components when power is on.

◆**Do Not Operate With Suspected Failures.** If suspected damage occurs with the device, have it inspected by qualified service personnel before further operations.

◆**Provide Proper Ventilation.** Refer to the installation instructions for proper ventilation of the device.

◆**Do not operate in Wet/Damp Conditions.**

◆**Do not operate in an Explosive Atmosphere.**

◆**Keep Product Surfaces Clean and Dry.**

Chapter 1 Getting Start

The oscilloscope is small, lightweight, no external power required, portable oscilloscopes! The oscilloscopes is ideal for production test, research and design and all of the applications involving analog circuits test and troubleshooting, as well as education and training.

In addition to the list of general features on the next page, this chapter describes how to do the following tasks:

- **System Requirements**
- **Install software**
- **Install Driver**
- **Connect Device**
- **General Features**
- **General Check**
- **Probe Compensation**
- **Function Check**
- **Self Calibration**

1.1 System Requirements

To run the oscilloscope software, the needs of computer configuration are as follows:

Minimum System Requirements

Operating System
Window XP/Vista/Win 7/Win 8/Win 10

Processor
Upwards of 1.00G processor

Memory
256M byte

Disk Space
500M disk free space

Screen resolution
800 x 600

Recommended Configuration

Operating System
Windows XP SP3 System

Processor
2.4G Processor

Memory
1G Byte Memory

Disk Space
80G Disk Space

Screen resolution
1024 x 768 or 1280 x 1024 resolution

DPI Setting
Normal Size (96DPI)

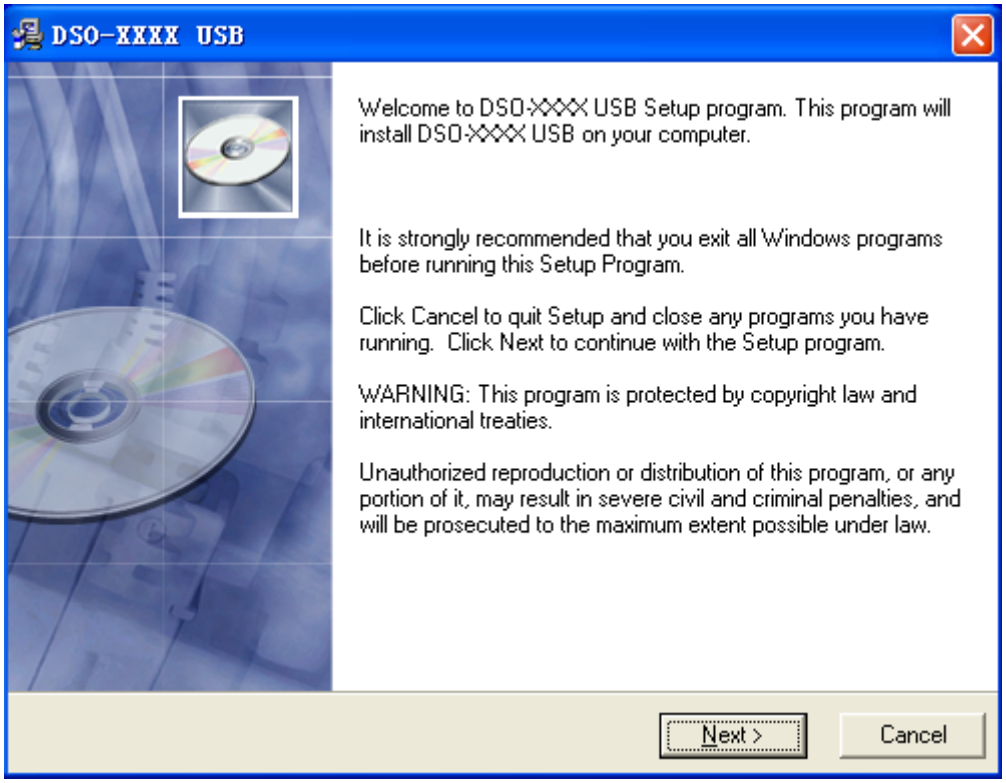
1.2 Install Software

Caution: You must install the software before using the oscilloscope.

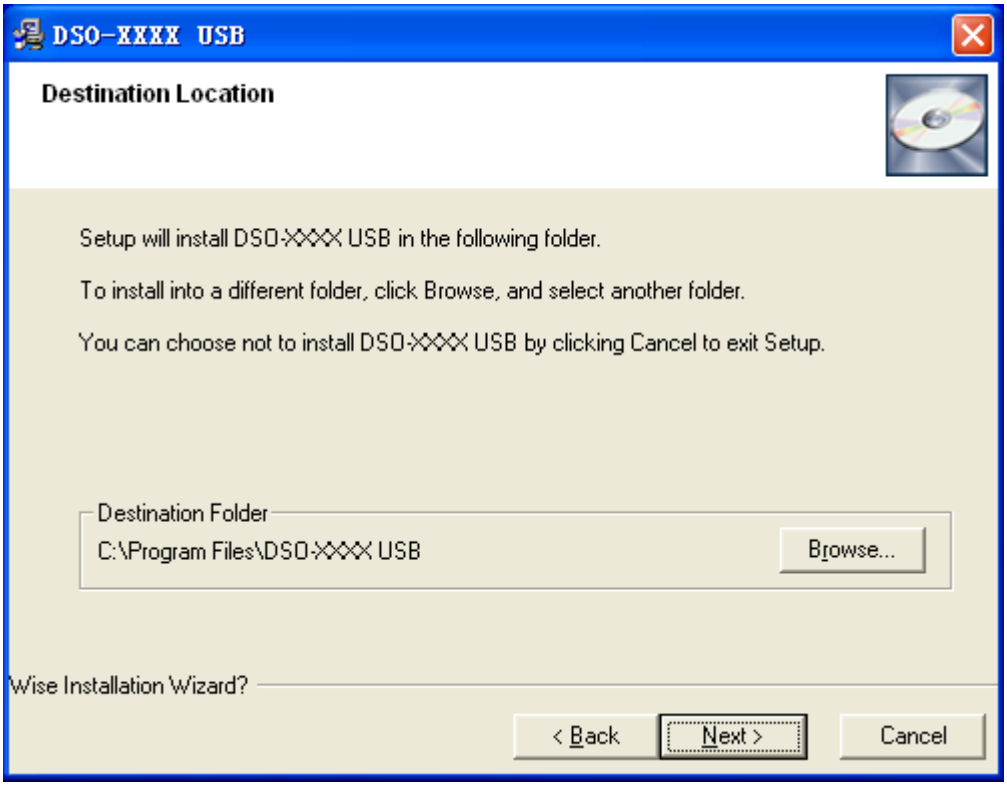
1. While in Windows, insert the installation CD into the CD-ROM drive.

2. The installation should start up automatically. Otherwise in Windows Explorer, switch to the CD-ROM drive and run Setup.exe.

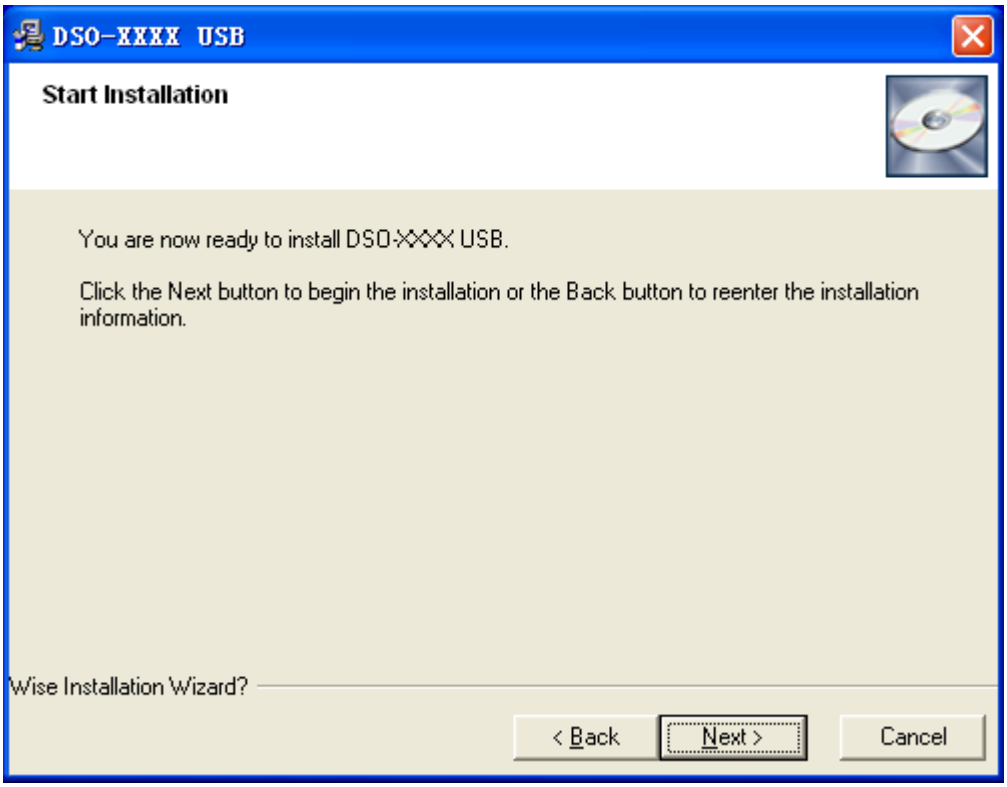
3. The software Installation is started. Click 'Next' to continue.



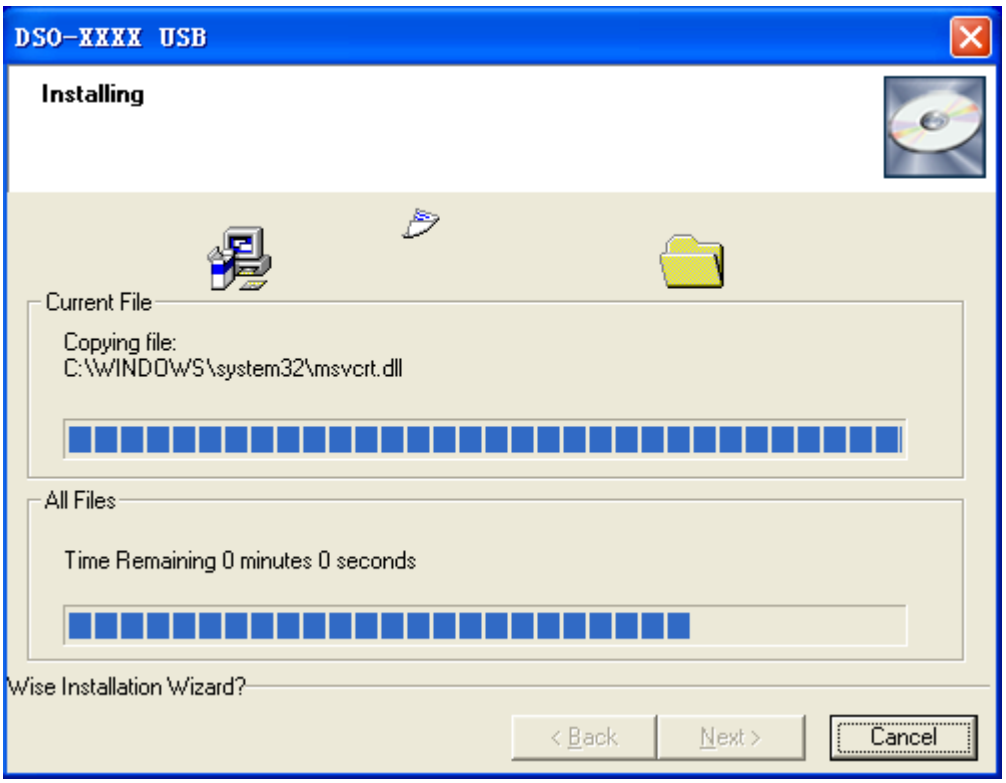
4. Choose a destination directory. Click 'Next' to continue.



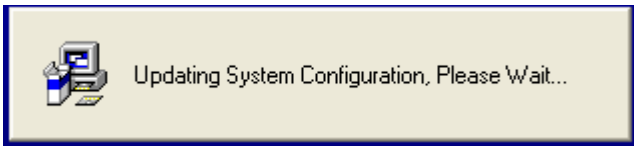
5. Check the setup information. Click Next to start copying of files.



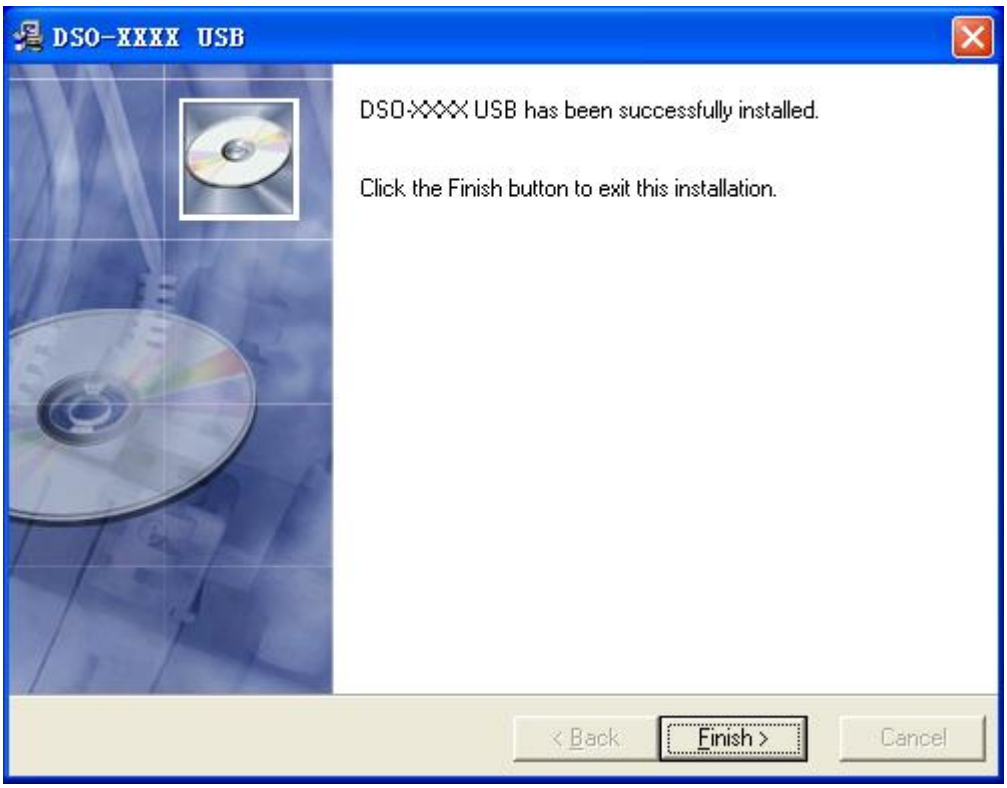
6. This Status dialog is displayed during copying of files.



7. Updating Your System Configuration.



8. The installation is complete.



1.3 Install Driver

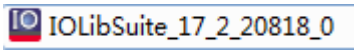
1. Download **Keysight IO libraries suite** and install。

   Open the following websit to download latest **Keysight IO Libraries Suite**：

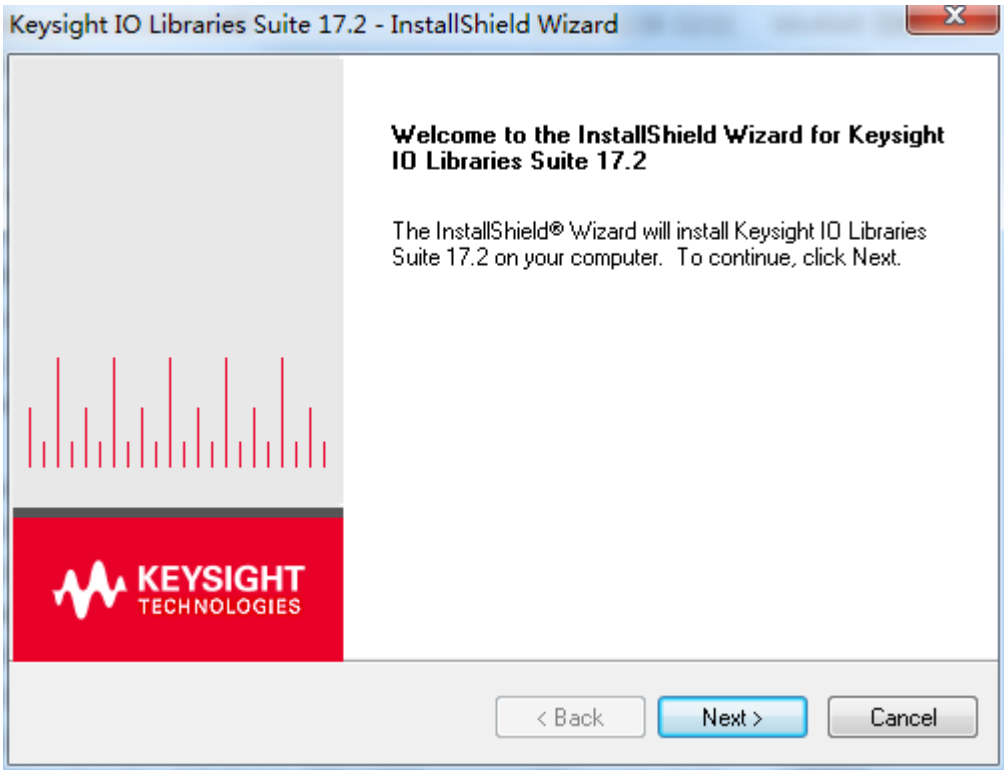
   http://www.keysight.com/main/software.jspx?ckey=2175637&id=2175637&nid=-11143.0.00&lc=eng&cc=GB

   Note: Please download and install *IOLibSuite_16_3_17218.exe* for PC of Windows XP system.

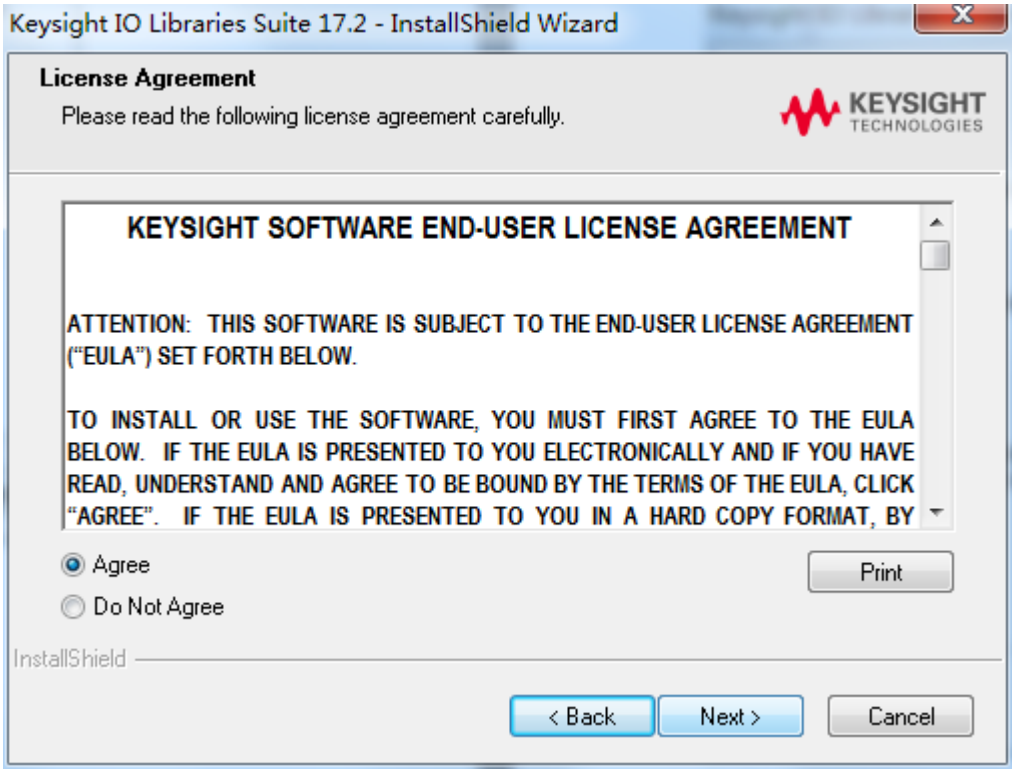
2. Double click the icon to start installing.



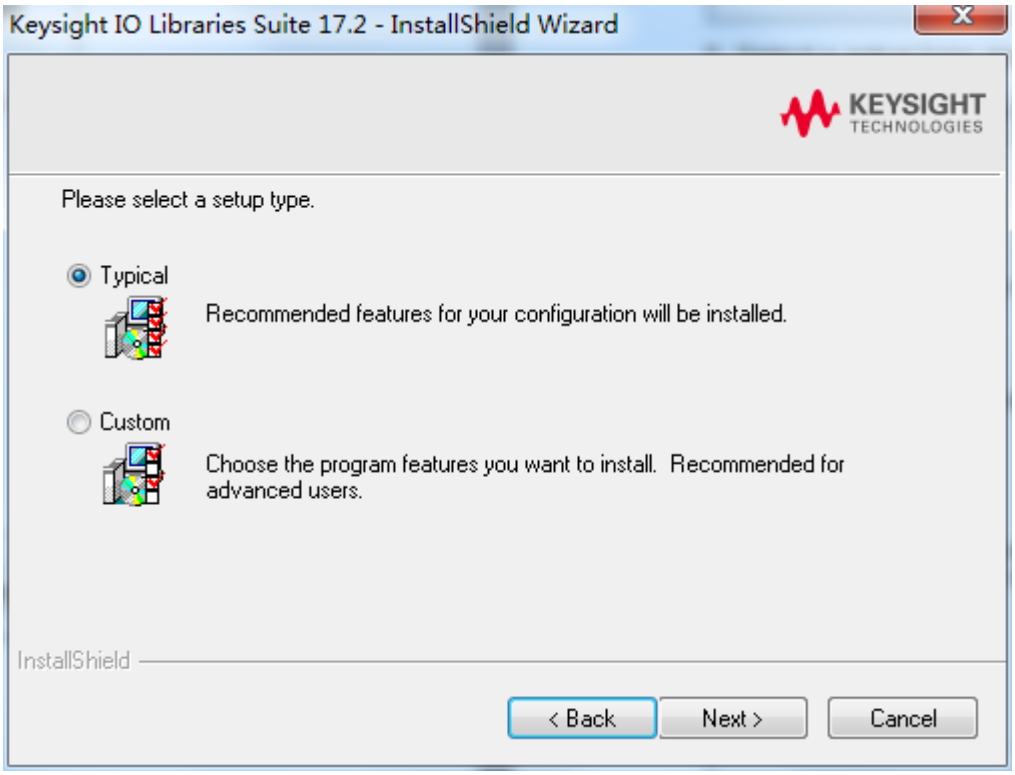
3. Click ‘Next’ to continue.



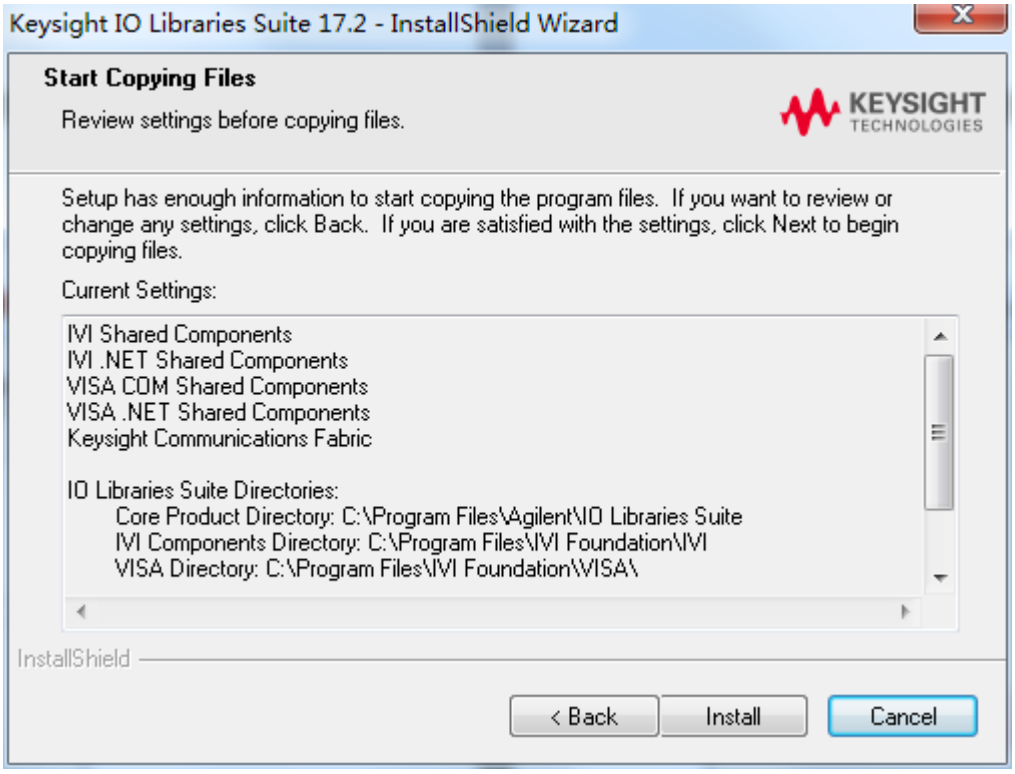
4. Read License Agreement and accept. Click ‘Next’ to continue.



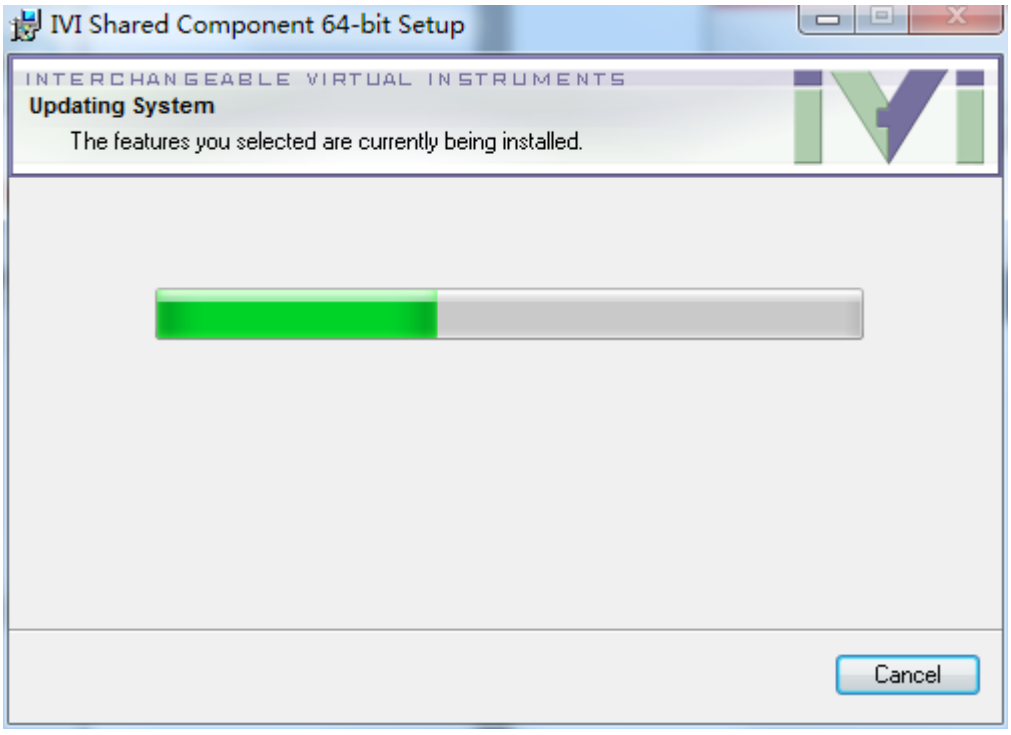
5. Select a setup type and click ‘Next’ to continue.



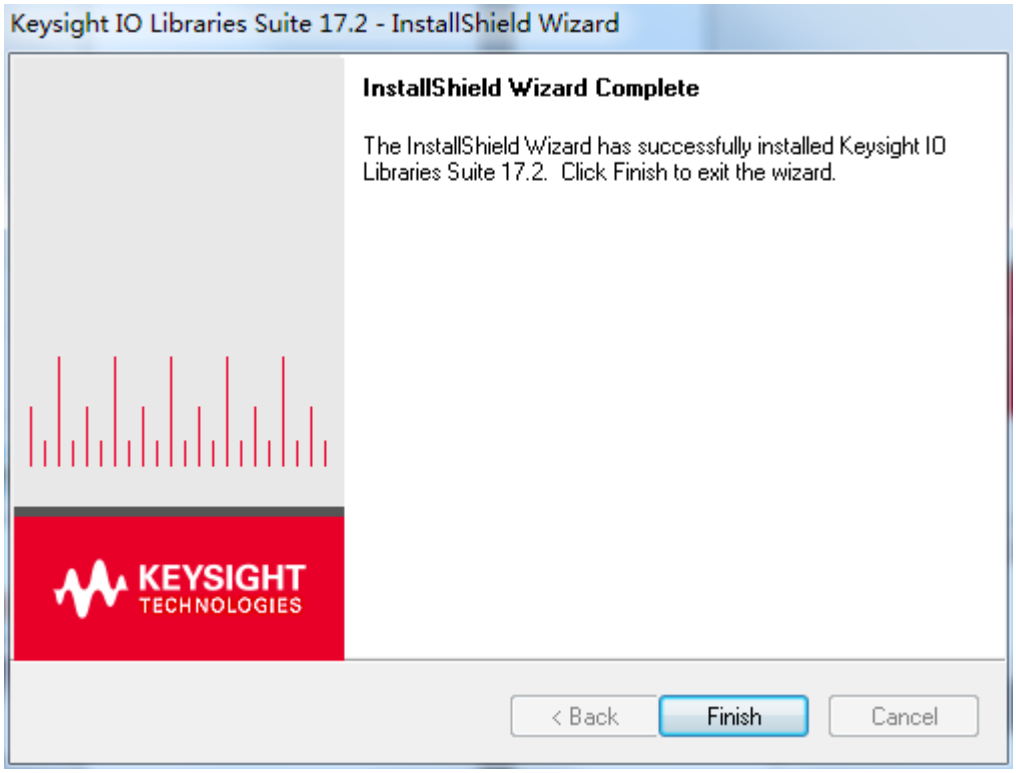
6. Click ‘Install’ to start copying files.

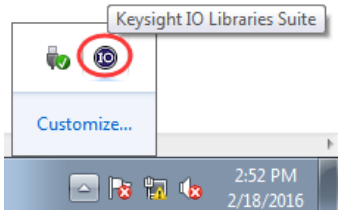


7. Prepare to install.



8. The installation is completed. you will see the running IO program in the lower right corner of the screen.



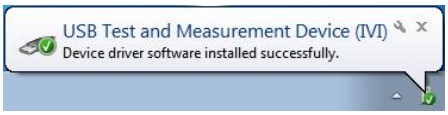


1.4 Connect Device

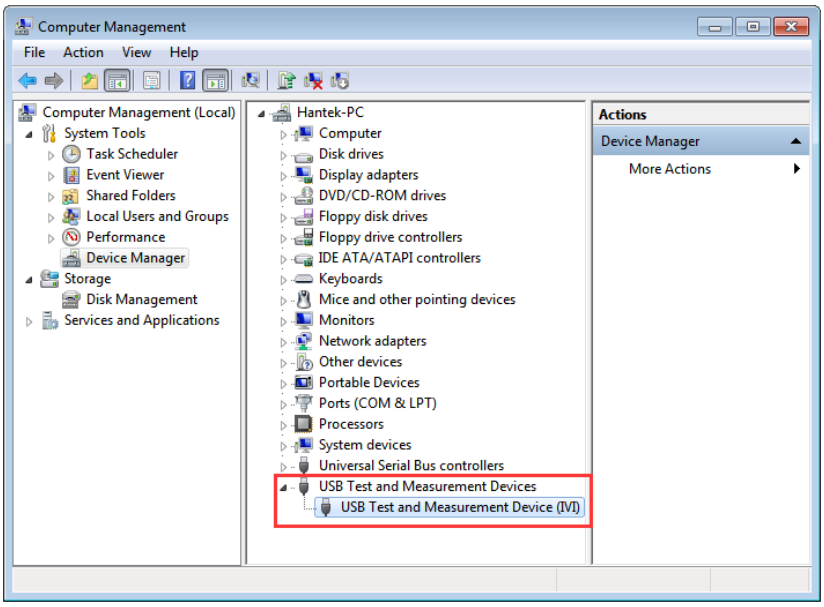
There are two connection modes: USB connection and LAN connection.

USB connection

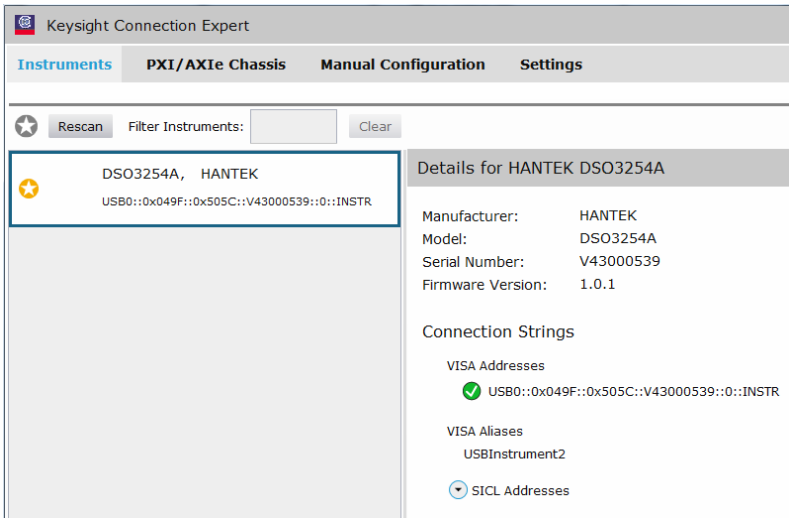
1.Power on. Connect DSO scope to PC via USB cable. The driver will install by itself. When the driver is installed successfully, there will have a prompt as follows:



2.After installing successfully, users can see the driver information in the computer management.



3.Click Keysight IO libraries suite icon in bottom right corner, and choice “Connection Expert”. Now users can see the device information.



4.If installing unsuccessfully, right click to update the driver manually, and choice the correct route: C:\Program Files\IVI Foundation\VISA\IVI USB Staging\b841aa80\Windows

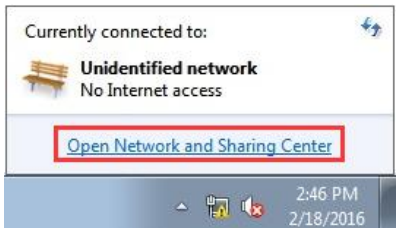
5.Double click “DSO-xxxx” shortcut on desktop to open the software of DSO device. The device is connected with PC successfully. You can see “Connected” tip in status column.

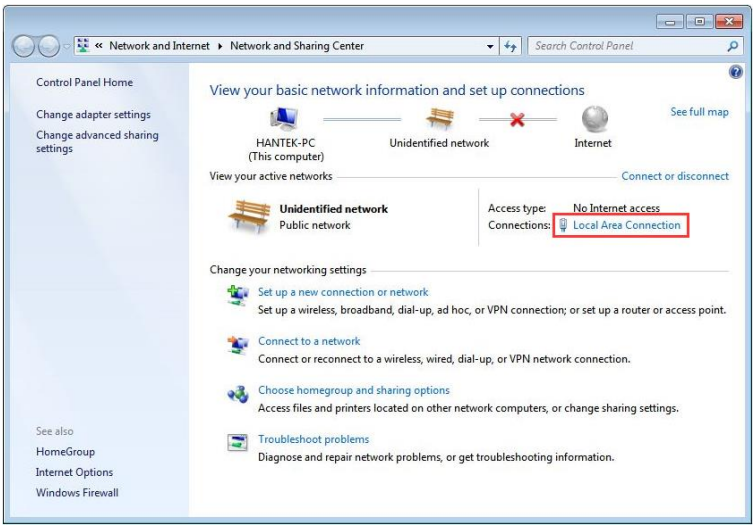
LAN connection

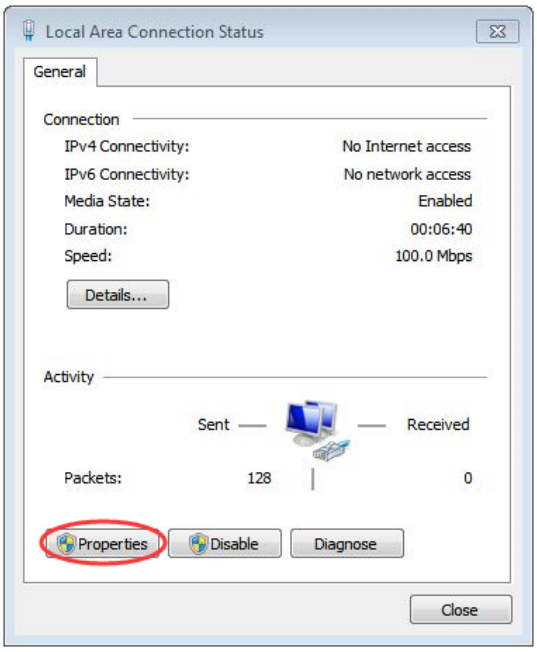
1.Set up local area network (LAN)

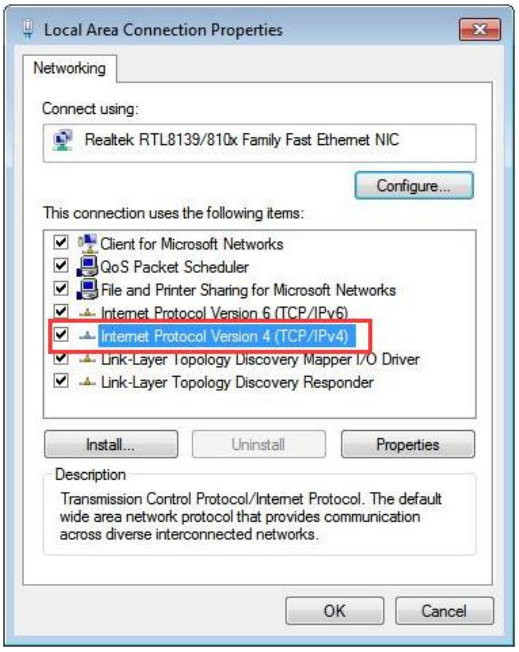
1)Connect router with DSO scope via one LAN cable. Connect router with PC via the another LAN cable.

2)“Open Network and Sharing Center->Local Area Connection-> Properties->Internet Protocol Version (TCP/IPv4)” . Set the right IP of PC in same network segment with the oscilloscope’s network name. The default IP is 192.168.1.127.

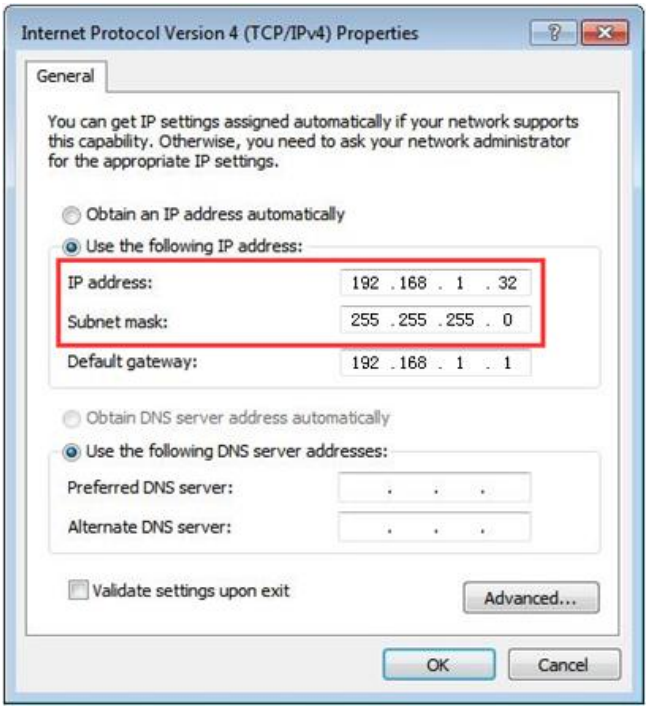




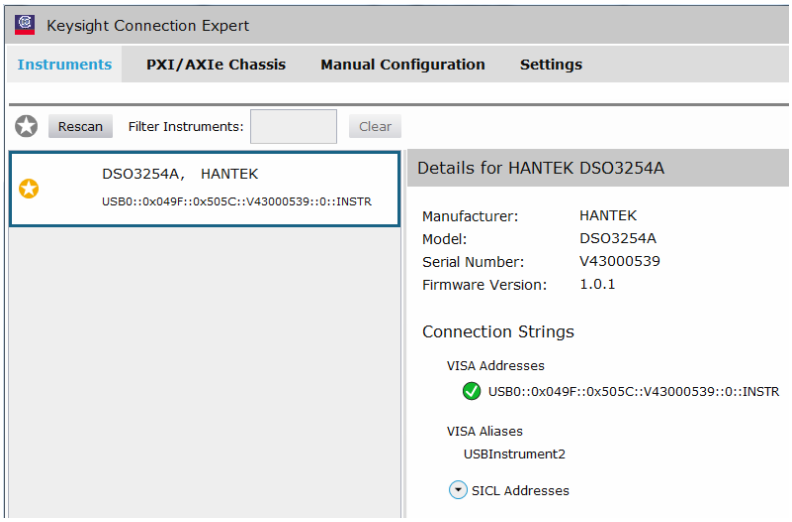




3)Set PC's IP to 192.168.1.2 or others(192.168.1.2~192.168.1.255) except 192.168.1.127. For example, the IP of the device is 192.168.1.32. Set Subnet mask in default.



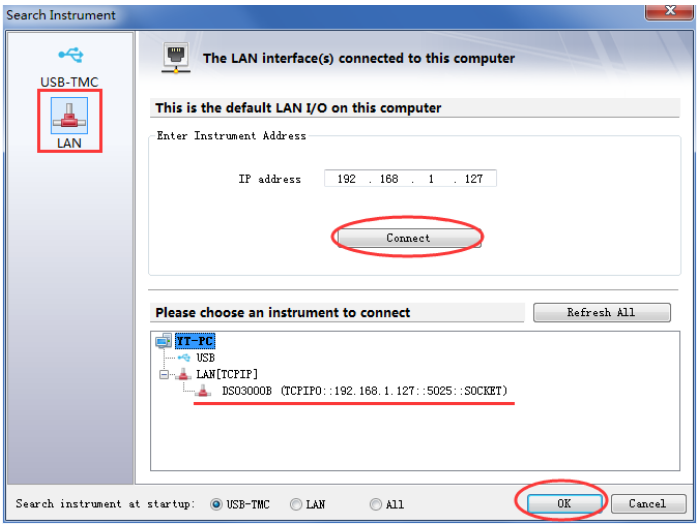
Click Keysight IO libraries suite icon in bottom right corner, and choice "Connection Expert". Now users can see the device information.



2.Connect Device

Double click “DSO-xxxx” shortcut on desktop (Or click “File->Connect” menu) to open the software of DSO device.

1)Select “**LAN**” type, the device connect setting dialog is as shown below:



2)The device is connected with PC successfully. You can see “Connected” tip in status column.

Note: In LAN mode, there is no need to use 12V power adapter.

1.5 General Features

Product Features:

- **Four Channels, Bandwidth:**
  100MHz (DSO3104, DSO3104A)
  200MHz (DSO3204, DSO3204A)
  250MHz (DSO3254, DSO3254A)
- **Maximum real-time sample rate:**
  1GSa/s
- **Memory depth:**
  1.6K-128M/CH
- **Automatic setup for ease of use (AUTOSET);**
- **Pass/Fail;**
- **Built-in Fast Fourier Transform function(FFT);**
- **20 Automatic measurements;**
- **Cursor measurements;**
- **waveform storage, record and replay dynamic waveforms;**
- **User selectable fast offset calibration;**
- **Add, Subtract , Multiply and Division Mathematic Functions;**
- **Selectable 20 MHz bandwidth limit;**
- **External trigger;**
- **Waveform average;**
- **Adjustable waveform intensity, more effective waveform view;**

1.6 General Check

Please check the instrument as following steps after receiving an oscilloscope:

Check the shipping container for damage:
Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

Check the accessories:
Accessories supplied with the instrument are listed in "Accessories" in this guide. If the contents are incomplete or damaged, please notify the franchiser.

Check the instrument:
In case there is any mechanical damage or defect, or the instrument does not operate properly or fails performance tests, please notify the franchiser.

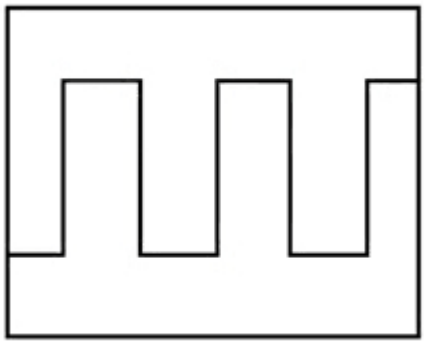
1.7 Probe Compensation

Perform this function to match the characteristics of the probe and the channel input. This should be performed whenever attaching a probe to any input channel at the first time.

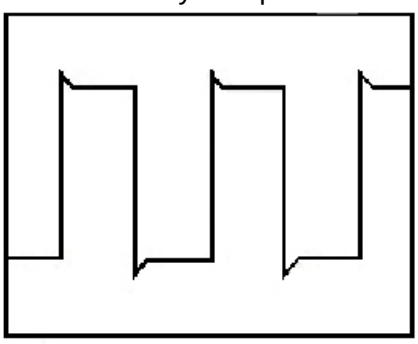
■ From the “Probe” menu, select attenuation to 1:10. Set the switch to “X10” on the probe and connect it to CH1 of the oscilloscope. When using the probe hook-tip, insert the tip onto the probe firmly to ensure a proper connection.

■ Attach the probe tip to the Probe Compensator and the reference lead to the ground connector, select CH1, and then press the “**AUTOSET**” button into the menu or the toolbar.

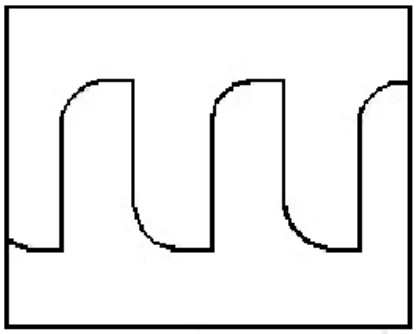
■ Check the shape of the displayed waveform.



Correctly Compensated



Over Compensated



Under Compensated

1. If necessary, use a non-metallic tool to adjust the trimmer capacitor of the probe for the fattest square wave being displayed on the oscilloscope.
2. Repeat if necessary.

WARNNING: To avoid electric shock while using the probe, be sure the perfection of the insulated cable, and do not touch the metallic portions of the probe head while it is connected with a voltage source.

1.8 Function Check

Perform this functional check to verify that your oscilloscope is operating correctly.

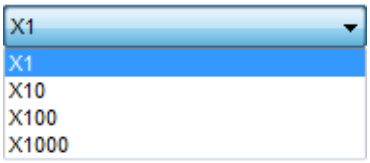
■ Connect the oscilloscope
You should connect the A-Type Plug of USB cable to your PC USB port and connect the other A-Type Plug of USB cable to oscilloscope USB port.

■ Input a signal to a channel of the oscilloscope
The oscilloscope is equipped with four channels.

Please input signal in the following steps:

1. Set the attenuation switch on the probe as 10X and connect the probe on the oscilloscope with CH1. Aim the slot in the probe connector at the faucet on BNC of CH1 and insert, then, turn right to lock the probe. Finally, attach the tip of probe and ground nip to the Connector of Probe compensator.

2. Set the CH1 probe attenuation of the oscilloscope to X10. (The default is X1).



3.Attach the tip of probe and ground nip to the Connector of Probe compensator. Click the

button. A square wave will be displayed within a several seconds. (Approximately 1 kHz, 1V, peak-to- peak).

4. Inspect CH2, CH3, CH4 with the same method. Repeat steps 2 and 3.

1.9 Self Calibration

The self calibration routine lets you optimize the oscilloscope signal path for maximum measurement accuracy. You can run the routine at any time but you should always run the routine if the ambient temperature changes by 5℃ or more. For accurate calibration, power on the oscilloscope and wait twenty minutes to ensure it is warmed up. To compensate the signal path, disconnect any probes or cables from the input connectors.
Then, access the **"Utility -> Calibration"** option and follow the directions on the screen.
The self calibration routine takes about several minutes.

Chapter 2 Operating Basics

◆The User's Interface

◆The Menu System

◆The Vertical System

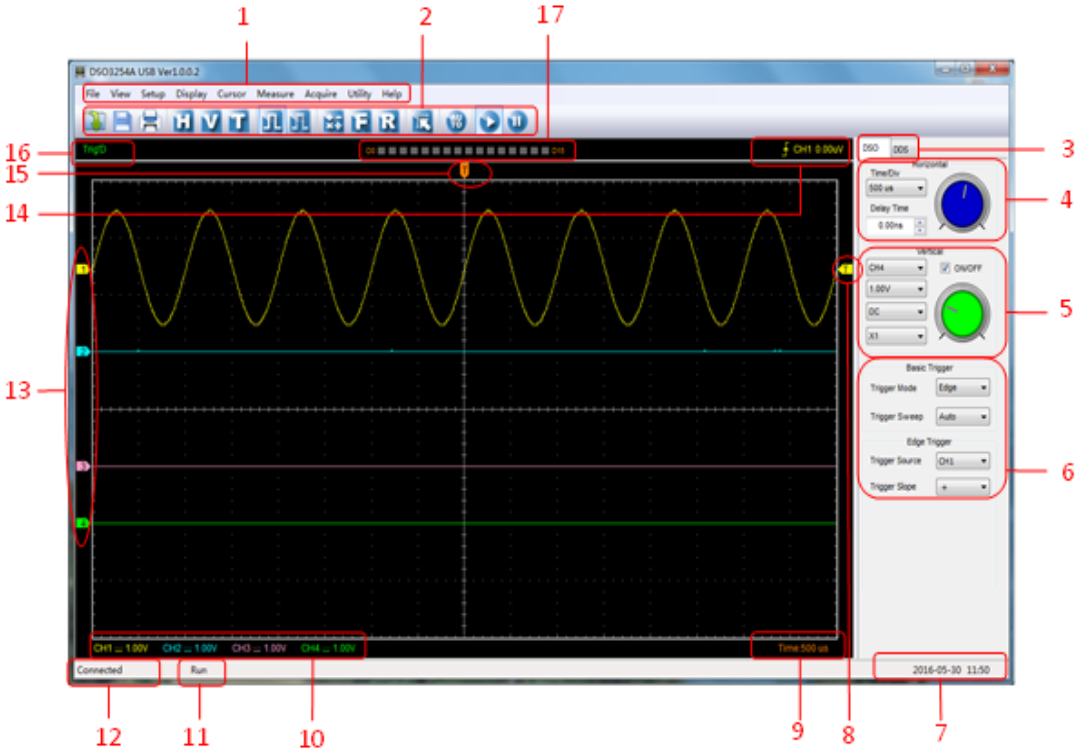
◆The Horizontal System

◆The Trigger System

◆Input Connectors

2.1 The User's Interface

Click the software icon on the desk after you finished the software setting and equipment connecting. Then a user interface will be showed as follows:



In addition to displaying waveforms, the display area is filled with many details about the waveform and the oscilloscope control settings.

1.The Main Menu

All settings can be found in the main menu.

2.The Toolbar

3.Change DSO and DDS

4.The Horizontal Panel

The user can change Time/Div, Delay Time in the panel.

5.The Vertical Panel

The user can turn on/off the CH1/CH2/CH3/CH4. Also the user can change the CH1/CH2/CH3 /CH4 volt/div, coupling and probe attenuation.

6.The Trigger Panel

In this panel, the user can change the trigger mode, sweep, source and slope.

7. It shows the system time.

8. Marker shows Edge trigger level.

9. It shows the main time base setting.

10.It shows the CH1/CH2/CH3/CH4 information.

Readouts show the coupling of the channels.

Readouts show the vertical scale factors of the channels.

A “B” icon indicates that the channel is bandwidth limited

11.The oscilloscope status

RUN: The oscilloscope is running.

STOP: The oscilloscope has stopped acquiring waveform data.

12.Status Information

Connected: The device is connected with PC successfully.

Demo: Don’t communicate with PC.

Searching device: Not find the device and the program is searching the device.

13.The markers show the CH1/CH2/CH3/CH4 reference points of the displayed waveforms.

If there is no marker, the channel is not displayed.

14.Display the trigger information.

Display the edge trigger slope, source and level.

15. Marker shows horizontal trigger position.

16. Trigger status indicates the following:

AUTO: The oscilloscope is in auto mode and is acquiring waveforms in the absence of triggers.

Trig’D: The oscilloscope has seen a trigger and is acquiring the post trigger data.

WAIT: All pretrigger data has been acquired and the oscilloscope is ready to accept a trigger.

STOP: The oscilloscope has stopped acquiring waveform data.

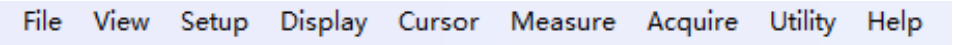
RUN: The oscilloscope is running.

PLAY: The oscilloscope is displaying the record waveforms.

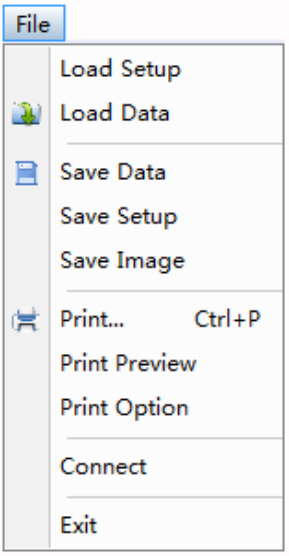
17. Logic analyzer

2.2 The Menu System

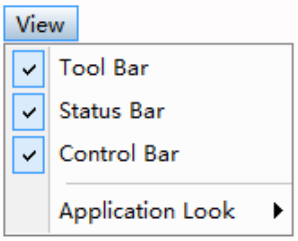
The Main Menu:



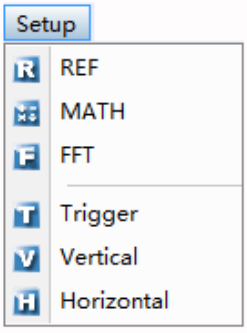
1.**File**: Load or Save data



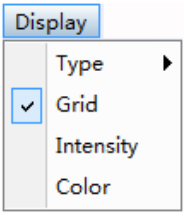
2.**View**: Change the user interface



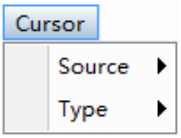
3.**Setup**: Setup setting



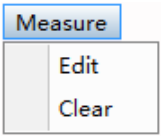
4.**Display**: Change wave display type



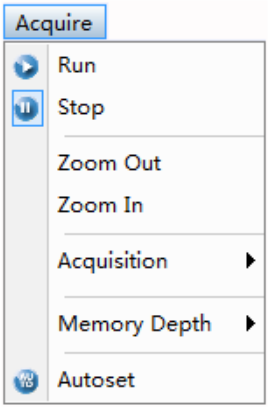
5.**Cursor**: Set Cursor measure type



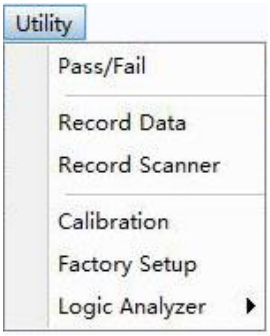
6. **Measure**: Set measurement parameters



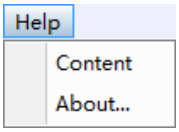
7.**Acquire**: Run ,Stop or other operation setting



8. **Utility**: Utility setting



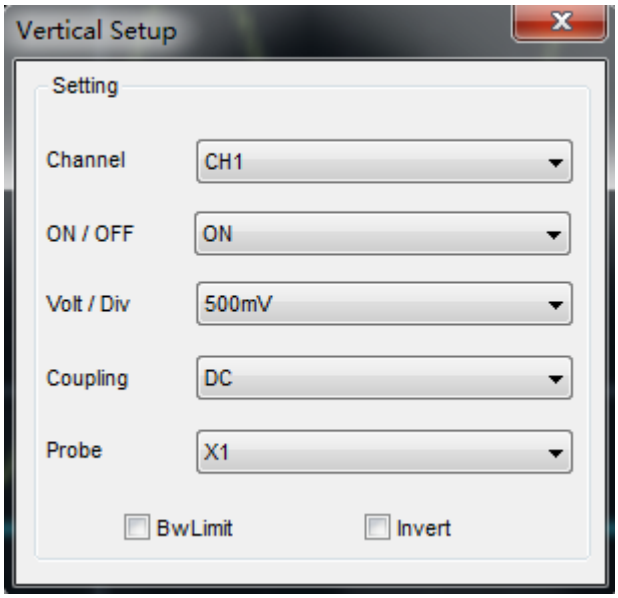
9.**Help**: Turn on help file



2.3 The Vertical System

Click **“Setup->Vertical”**

The following figure shows the vertical Setup window. It shows the vertical parameters setting.



1.**Select channel**: User can select the channel by clicking the Combo box.

2.**ON/OFF**: Turn on or off the selected channel.

3.**Volt/Div**: Set the selected channel voltage range.

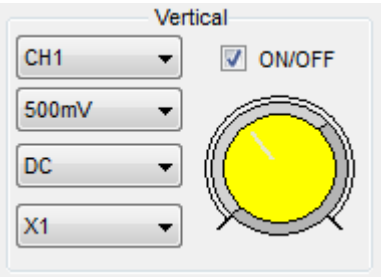
4.**Coupling**: Set the selected channel to DC/AC/GND.

5.**Probe**: Set the Select one according to the probe attenuation factor to ensure correct vertical scale reading

6.**Bw Limit**: Reject the frequency component higher than 20MHz.

7.**Invert**: Invert the selected wave.

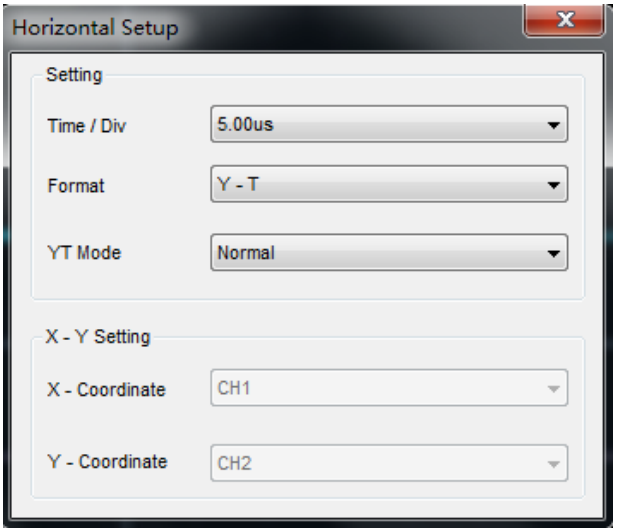
Also user can also set parameters in the right sidebar.



2.4 The Horizontal System

Click **“Setup->Horizontal”**

The following figure shows the Horizontal System window. It shows the horizontal parameters settings.



1.**Time/Div**: Leads the setting of the time base parameters

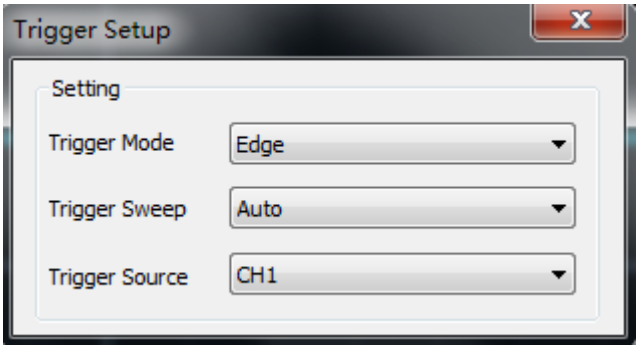
2.**Format**: Leads the setting of the horizontal format parameters

3.**YT Mode**: Selects the mode of Normal, Roll or Scan.

2.5 The Trigger System

Click **“Setup**-> **Trigger”**

The following figure shows the trigger system control.



The trigger determines when the oscilloscope begins to acquire data and display a waveform. Once a trigger is properly set up, the oscilloscope can convert unstable displays or blank screens to meaningful waveforms. Here introduce some basic concepts about trigger.

Trigger Source: The trigger can be generated with multiple sources. The most common one is the input channel. Whether the input signal is displayed or not, it can trigger normal operations. Also the trigger source can be any signal connected to an external trigger channel or the AC power line (only for Edge triggers). The source with the AC power line shows the frequency relationship between the signal and the AC commercial power.

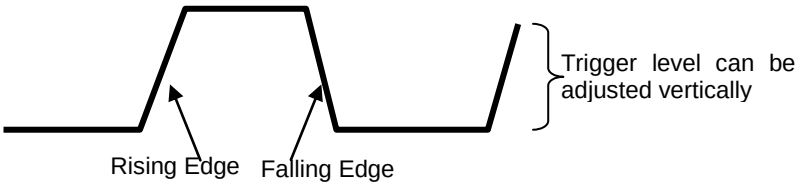
Trigger Mode: The oscilloscope has five types of triggers: Edge, Pulse Width, Slope, Video and Timeout.

- **Edge Trigger** uses the analog or digital test circuits for triggering. It happens when the input trigger source crosses a specified level in a specified direction.
- **Pulse Width Trigger** can trigger normal or abnormal pulses that meet trigger conditions.
- **Slope Trigger** uses the rise and fall times on the edge of signal for triggering.
- **Video Trigger** performs a field or line trigger through standard video signals.
- **Timeout Trigger** happens after the edge of signal reaches the set time.

Trigger Sweep: You can select the Auto or Normal mode to define how the oscilloscope acquires data when it does not detect a trigger condition. **Auto Mode** performs the acquisition freely in absence of valid trigger. **Normal Mode** updates the displayed waveforms only when the oscilloscope detects a valid trigger condition. Before this update, the oscilloscope still displays the old waveforms. This mode shall be used when you want to only view the effectively triggered waveforms. In this mode, the oscilloscope displays waveforms only after the first trigger. To perform a **single sequence acquisition**, push the SINGLE SEQ button.

Trigger Position: The horizontal position control establishes the time between the trigger position and the screen center.

Slope and Level: The Slope and Level controls help to define the trigger. The Slope option determines whether the trigger point is on the rising or falling edge of a signal. To perform the trigger slope control, press the TRIG MENU button, select an Edge trigger, and use the Slope button to select rising or falling. The TRIGGER LEVEL knob controls the trigger point is on which position of the edge.



Trigger slope can be rising or falling

2.6 Input Connectors

CH1/CH2/CH3/CH4: Input connectors for waveform display.

LOGIC IN：Logic analyzer input ports

LOGIC OUT：Digital generator output ports

1KHz~1Vp-p：1KHz, 1Vp-p Square wave output ports

GND.: A ground terminal

Other Connector:

Power: Power Input port.

USB HOST: USB HOST port, used to insert into USB storage device.

USB DEVICE: USB port, used to connect the scope with PC via USB cable.

LANPoE: Power Over Ethernet port, used to connect the scope with PC via LAN and power over ethernet.

SD: MicroSD port, used to insert into microSD card to storage data.

OUTPUT: Waveform output BNC port in waveform generator mode.

E-TRIG/S:

1. **E-TRIG**: External trigger signal port (For the model of waveform generator function, it can be used as an external trigger of the oscilloscope and waveform generator.)
2. **S**: Synchronized output port (Only for the model with waveform generator function.)

Attention: The above two functions cannot be used at the same time. When one function is used, the other function is automatically closed.

Chapter 3 Oscilloscope Functions

◆Set Oscilloscope

◆Set Vertical System

◆Set Horizontal System

◆Set Trigger System

◆Set MATH

◆Set Reference

◆Fast Fourier Transform Function

◆Save/Load

◆Utility Function

◆Measure Signal

◆Display System

◆Zoom In/Out Waveforms

◆Acquisition Modes

◆Print

3.1 Setup the Oscilloscope

Use "AUTOSET" to display a signal automatically.

Auto setup functions one time each time you push the "**AUTOSET**" button. The function obtains a stable waveform display for you. It automatically adjusts the vertical scale, horizontal scale and trigger settings. Auto setup also displays several automatic measurements in the graticule area, depending on the signal type.

Connect a signal to the CH1 input:

1. Connect a signal to the oscilloscope as described above.

2. Click the **"Acquire -> Autoset"** button.

The oscilloscope will change the current settings to display this signal.

Save Setup

The oscilloscope software saves the current setup before you close the oscilloscope software. The oscilloscope recalls this setup the next time you run the software. You can use the **"Save Setup"** menu to permanently save up to several different setups.

Load Setup

The oscilloscope can recall the last setup before the oscilloscope software was running, any saved setups, or the factory setup. You can use the "**Load Setup**" menu to recall a setup.

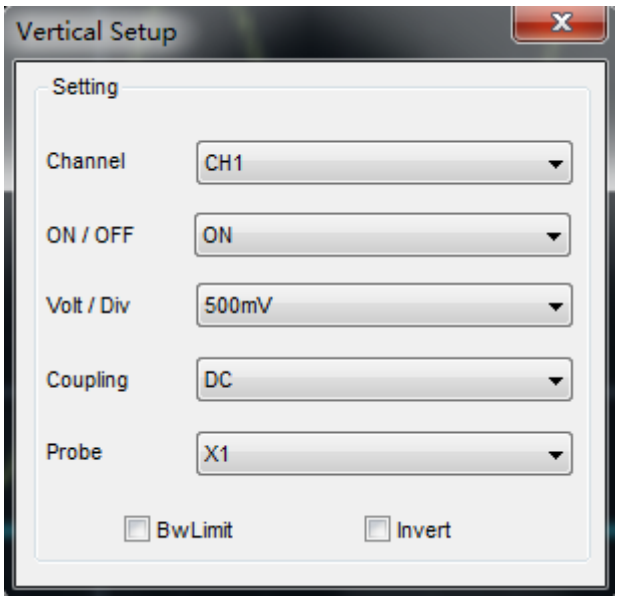
Factory Setup

The oscilloscope software is set up for normal operation when it is shipped from the factory. This is the factory setup. To recall this setup, push the "**Utility -> Factory Setup**" button.

3.2 Set Vertical System

Click **“Vertical”** in **“Setup”** menu.

The following figure shows the Vertical System window. It shows the vertical parameters settings.



➢**Vertical Position icon**

Drag Vertical Position icon 1 2 3 4 to move waveform up and down on the screen. Double click the icon to reset the waveforms to the vertical center position on the screen.

Change Volt/Div

You can click “**Volt/Div**” in “**Vertical Setting**” window to set the voltage.

You can left click and drag the mouse on the knob to change the voltage.

Set Channel Coupling

Click “**Coupling**” in “**Vertical Setup**” window

You can set the coupling to **DC**, **AC** or **GND**. If you set the coupling to **AC**, it blocks the **DC** component of the input signal.

Probe Attenuation Setting

Select the attenuation factor for the probe. To check the probe attenuation setting, toggle the probe menu to match the attenuation factor of the probe.

This setting remains in effect before you changed again. Click **“Probe”** in “**Vertical Setting**” window to select the probe attenuation.

Note: The attenuation factor changes the vertical scale of the oscilloscope so that the measurement results refect the actual voltage levels at the probe tip.

➢Bandwidth Limit

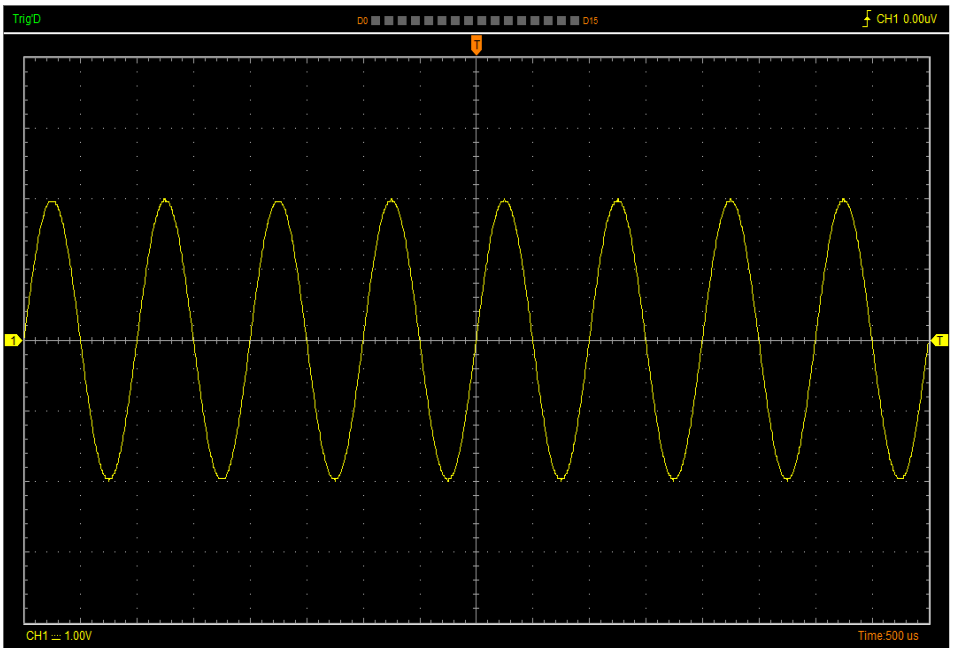
The oscilloscope is set to full bandwidth and will pass the high frequency component in the signal if the **"BW Limit**" was turned off.
The oscilloscope will reject the frequency component higher than 20MHz if the **"BW Limit**" was turned on.

➢Invert

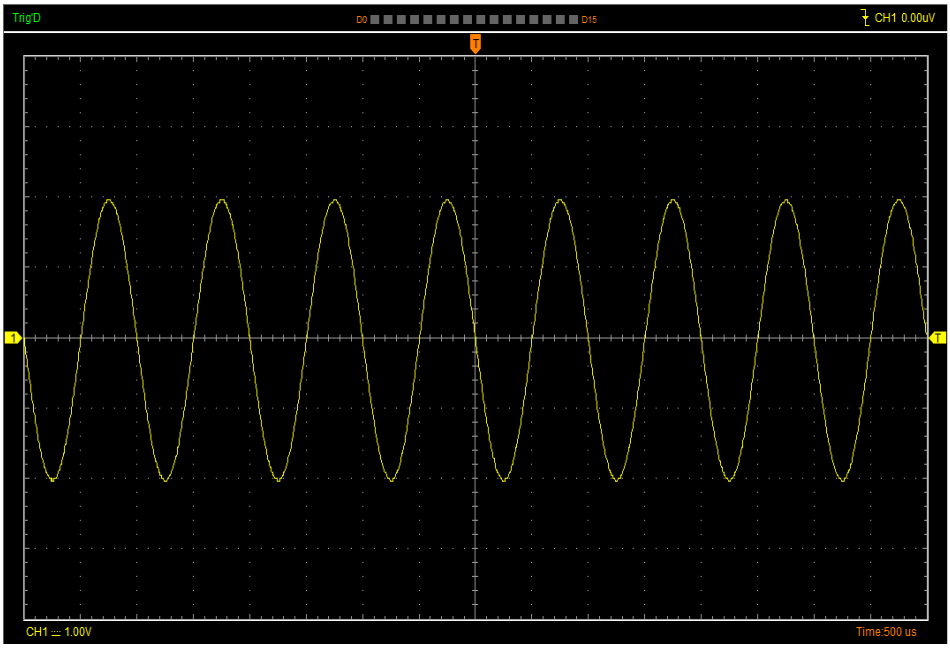
The invert function turns the displayed waveform 180 degrees, with respect to the ground level. When the oscilloscope is triggered on the inverted signal, the trigger is also inverted.

Click **"Invert"** in "**Vertical Setup**" window.

The following picture shows the waveform before inversion:



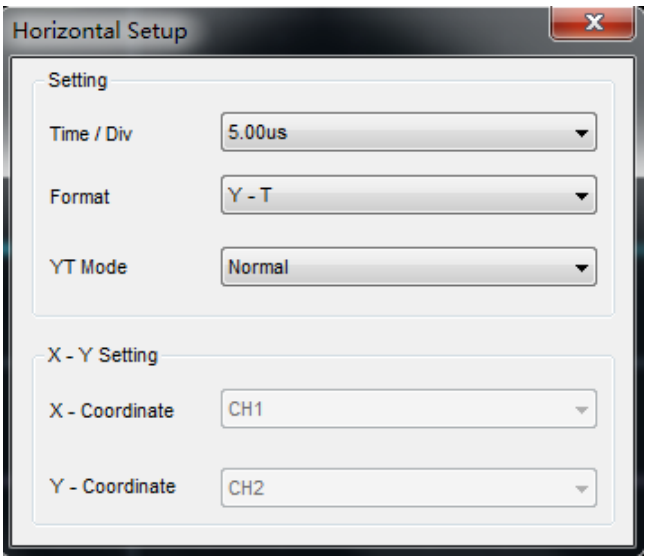
The following picture shows the waveform of inversion:



3.3 Set Horizontal System

Click **"Setup->Horizontal"** menu.

The following figure shows the Horizontal System window. It shows the horizontal parameters settings.



➢**Horizontal Setting**

Time/div: Lead the setting of the time base parameters

Format: Lead the setting of the horizontal format parameters

➢**Format**

Set the waveform display format (**Y-T**, **X-Y**, **Scan** and **Roll**).

Y -T: Show the relative relation between vertical voltage and horizontal time.

X -Y: Show CH1 value at X axis; CH2 value at Y axis. The XY format is used to analyzer phase difference, such as those represented by Lissajous patterns. Please refer to 4.3 Section.

X-Y Setting: Users can change X-Coordinate and Y-Coordinate for CH1, CH2, CH3, CH4.

➢**YT Mode**

Scan: In Scan Mode, the waveform display updates from left to right.

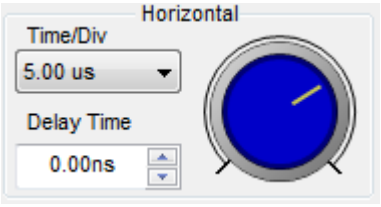
Roll: In Roll Mode, the waveform display updates from right to left.

In **Roll** mode, the waveform display rolls from right to left. No trigger or horizontal offset control of waveforms is available during Roll Mode, and it's only available when set to 100ms/div or slower.

➢Horizontal Position Icon

Drag Horizontal Position icon on screen to adjust the trigger position against screen. Double click the icon to reset the trigger point back to the screen center.

The Horizontal Panel:

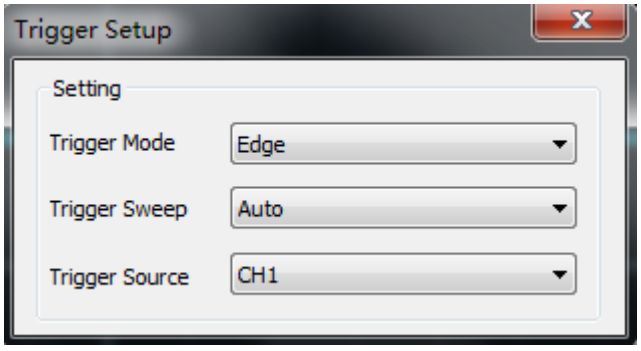


Time/Div: Lead the setting of the time base parameters

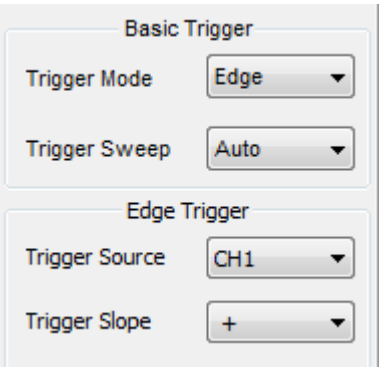
Delay Time: Adjust the trigger position

3.4 Set Trigger System

Click **"Setup->Trigger"** or " ", you can configure the trigger.



The user can also change the trigger setting on trigger panel in sidebar.



➢**Trigger Setup**

The trigger determines when the oscilloscope starts to acquire data and display a waveform. When a trigger is set up properly, it can convert unstable displays or blank screens into meaningful waveforms.

If the oscilloscope wants to acquire a waveform, it collects enough data so that it can draw the waveform to the left of the trigger point. The oscilloscope continues to acquire data while waiting for the trigger condition to occur. The oscilloscope continues to acquire enough data so that it can draw the waveform to the right of the trigger point after it detects a trigger.

The Edge trigger determines whether the scope finds the trigger point on the rising or the falling edge of the signal. Select Edge trigger mode to trigger on Rising edge or Falling edge.

Trigger Mode: Select the trigger mode, Edge, Pulse, Slope, Video or Timeout..

Trigger Sweep: Set the sweep mode to **Auto**, **Normal** or **Single**.

Auto: Acquire waveform even no trigger occurred

Normal: Acquire waveform when trigger occurred.

Single: Acquire waveform when trigger occurred then stop.

Trigger Source: You can use the trigger source options to select the signal that the oscilloscope uses as a trigger. The source can be any signal connected to a channel BNC.

CH1: Select CH1 as trigger signal

CH2: Select CH2 as trigger signal

CH3: Select CH3 as trigger signal

CH4: Select CH4 as trigger signal

EXT/10: Select external signal as trigger signal. Does not display the trigger signal and **a**ttenuates the signal by a factor of 10.

Trigger Slope: Set the slope to **Rising (+)** or **Falling (-)**.

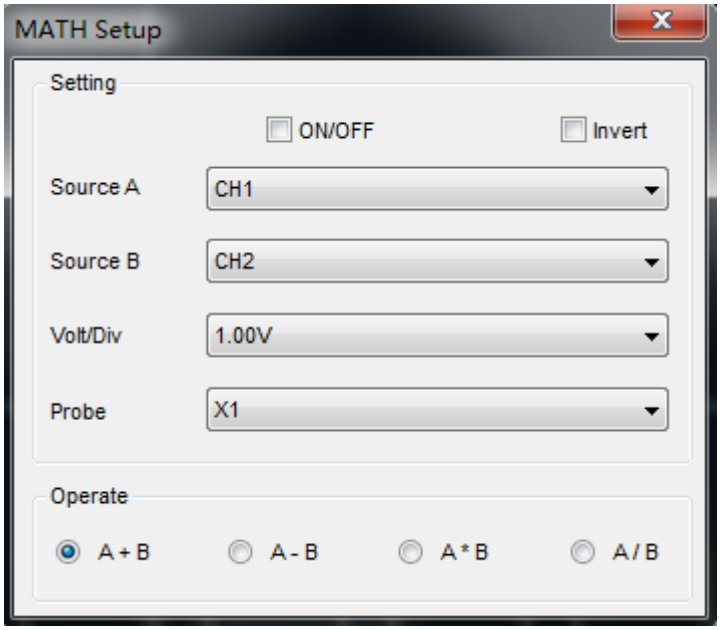
Rising: Trigger on rising edge

Falling: Trigger on falling edge

3.5 Set MATH

Click **"Setup->MATH"** or " ", you can set the Math.

The **MATH Setup** window:



ON/OFF: Turn On/Off the MATH Channel.

Invert: Turn on/off the invert function

Source A/B: Set the sources of the math channel.

Volt/DIV: Set the resolution of the math channel.

Probe: Set the math channel probe attenuation.

Operate: Set operation type of the math channel.

The mathematic functions include addition, subtraction, multiplication, division.

Operate

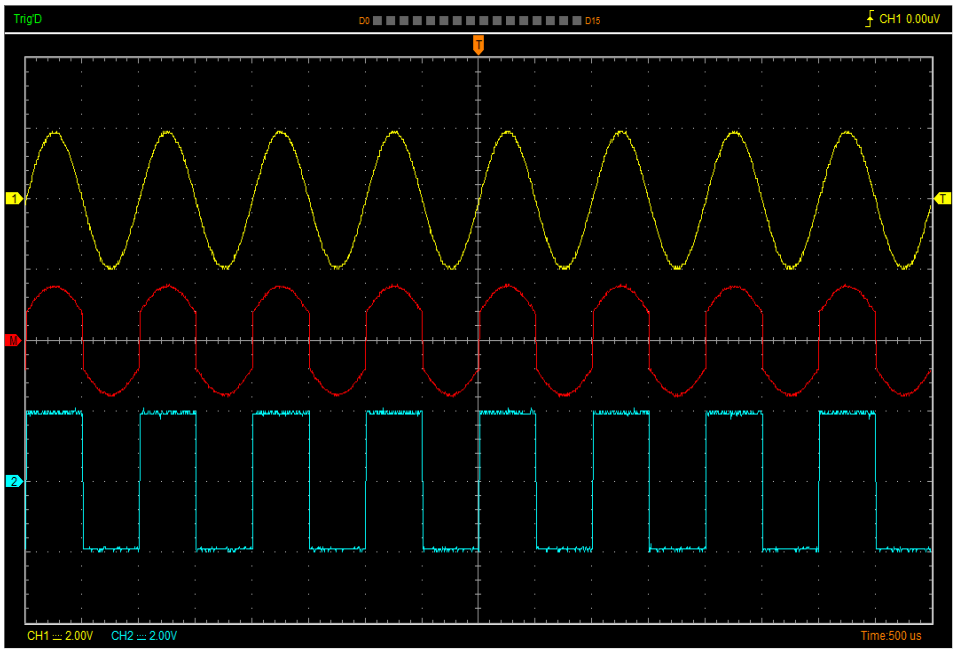
Four Types:

A + B	Add source A and source B
A - B	Subtract source B from source A
A x B	Multiply source A by source B
A / B	Divide source A by source B

In this function, use the addition, subtraction, multiplication and division function to operate and analyze the waveform.

Select the operate type in the **Operate** menu. Select source A and B. Then adjust the vertical scale and offset to view the math channel clearly. The mathematic result can be measured by the measure and the cursor.

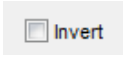
The Math Function Display



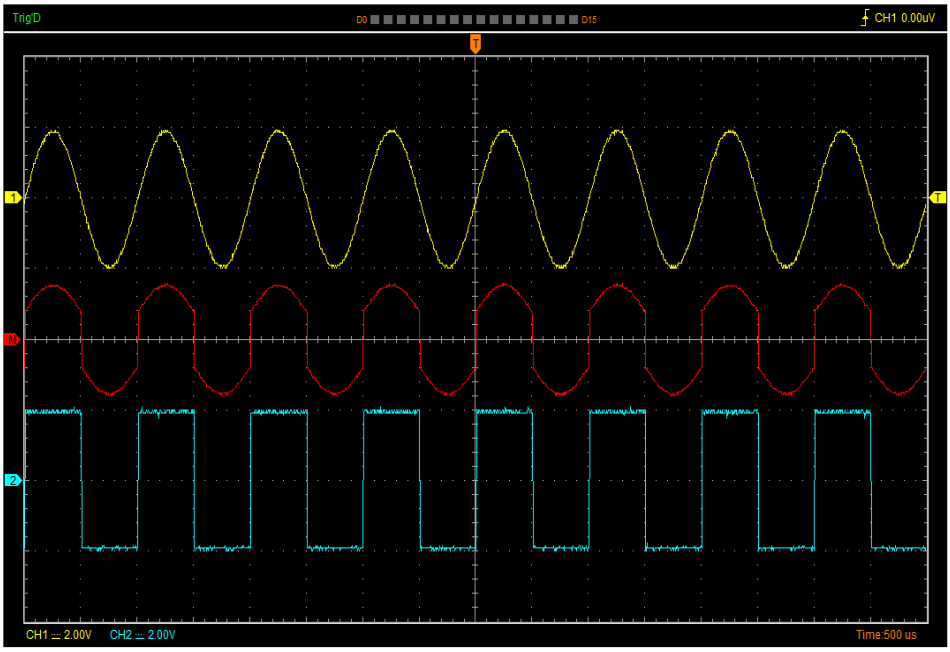
Invert

The invert function turns the displayed waveform 180 degrees, with respect to the ground level. When the oscilloscope is triggered on the inverted signal, the trigger is also inverted.

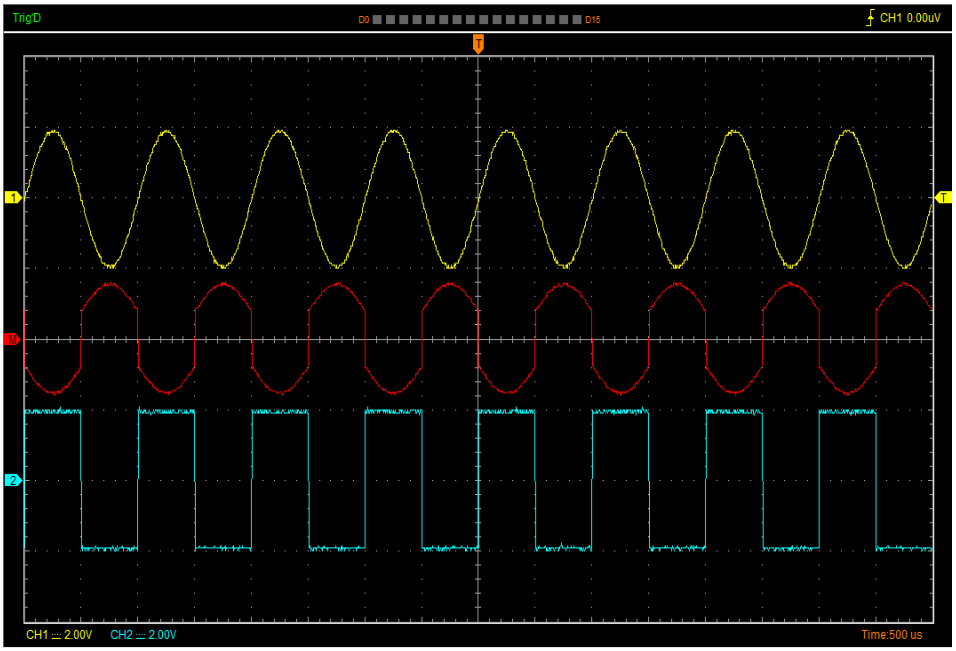
Click **"Invert"** in MATH.



The following picture shows the waveform before inversion:

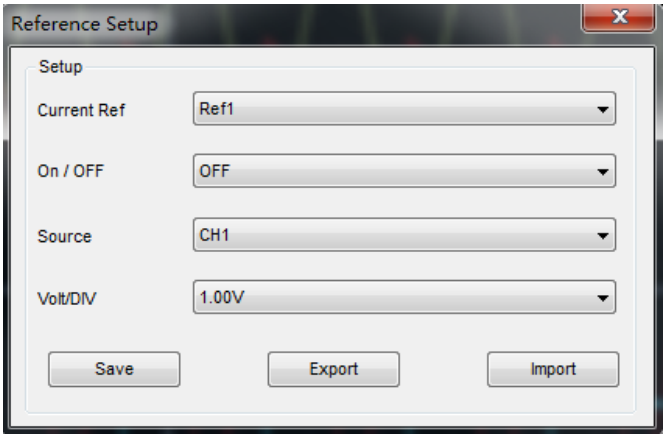


The following picture shows the waveform of inversion:



3.6 Set Reference

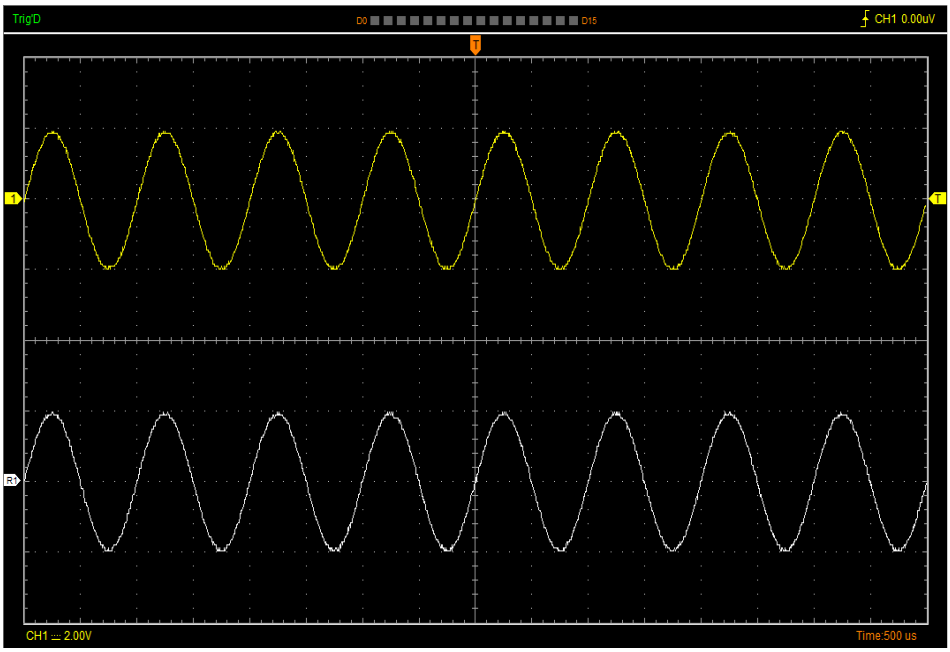
Click **“REF”** in **“Setup”** menu to set REF channel.



The Reference Channel Function:

On/Off: Turn on/off the reference channel.
Source: Select the saved source.
Volt/DIV: Change the resolution of the reference channel.
Save: Save the current reference waveform to the Ref1 or Ref2.
Export: Export the current reference waveform to your computer as “.rfc” format.
Import: Import the reference waveform from the “.rfc” file from your computer.
You can change the vertical scale of a waveform. The waveform display will contract or expand relative to the reference level.

The Reference Waveform Display Window:



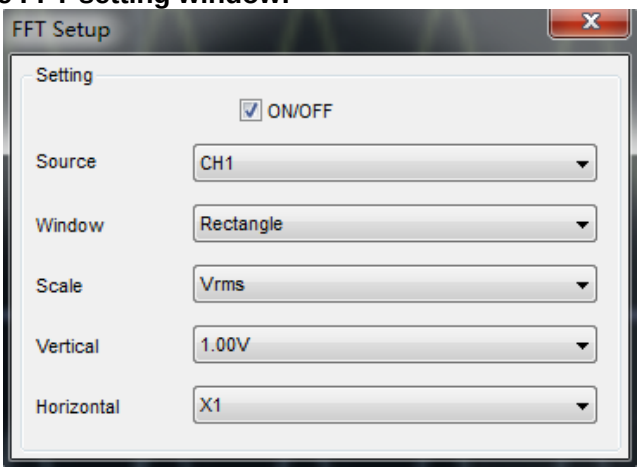
Note: If you turn on the “Reference” channel, the load file window will appear.

3.7 Fast Fourier Transform Function

User can use the FFT mode to convert a time-domain signal into its frequency components (spectrum). You can use the FFT mode for the following types of analysis:

To use the FFT mode, you need to click "**Setup-> FFT**" to open the FFT setting window.

The FFT setting window:



You can select the Source channel, Window type, FFT vertical scale units, vertical scale and FFT Zoom factor. It displays only one FFT spectrum at a time.

Source: Selects the channel used as the FFT source.

Window: Selects the FFT window type.

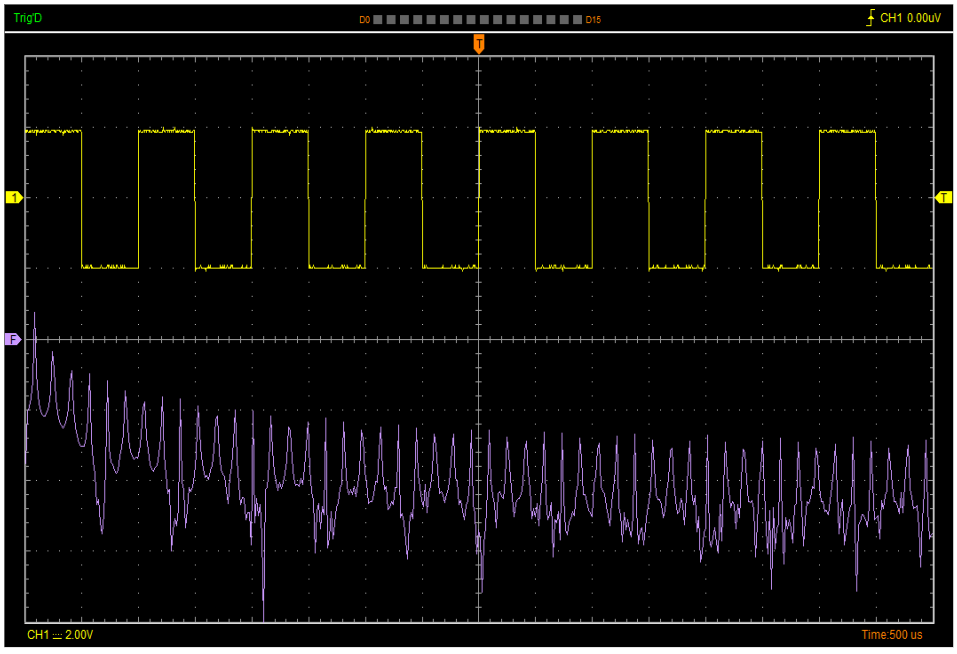
The window reduces spectral leakage in the FFT spectrum.

Scale: Selects the vertical scale units.

Vertical: Selects the vertical scale.

Horizontal: Selects the FFT zoom factor.

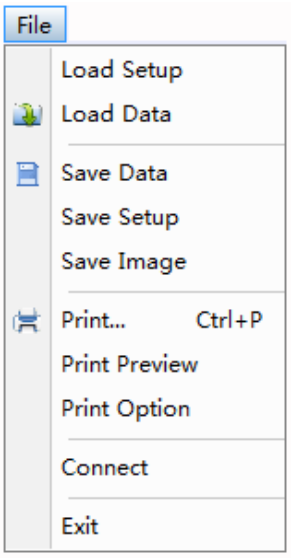
The FFT display Window:



3.8 Save/Load

➢**Save**

Click **"File"** in main menu to save waveform data, setups and image.



1. Save Data

Save waveform data as a .txt, .csv, .xls, .doc or .wfm file.

2. Save Setup

Save the current oscilloscope setup to .set file.

3. Save Image

Save the software display window as a .bmp or .jpg file.

➢**Load**

Click **"File"** in main menu to recall saved waveform and setup.

1. Load Data

Load the waveform that had saved as a .wfm or .rfc file.

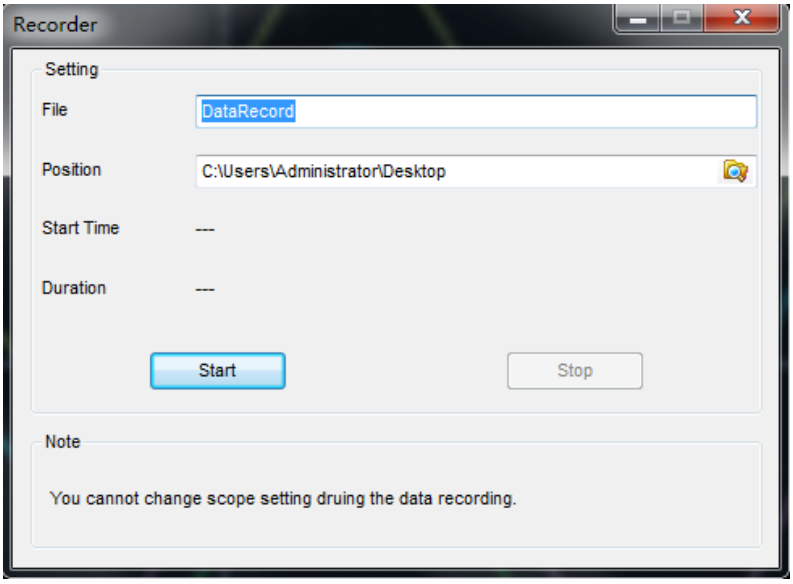
2. Load Setup

Load the instrument that had saved.

3.9 Utility Function

3.9.1 Record Data and Record Scanner

Click **“Record Data”** in **“Utility”** menu. The following picture shows the **Recorder** window.



This function can record input waveform form CH1, CH2, CH3 and CH4.

“Start” button: Start to record waveforms.

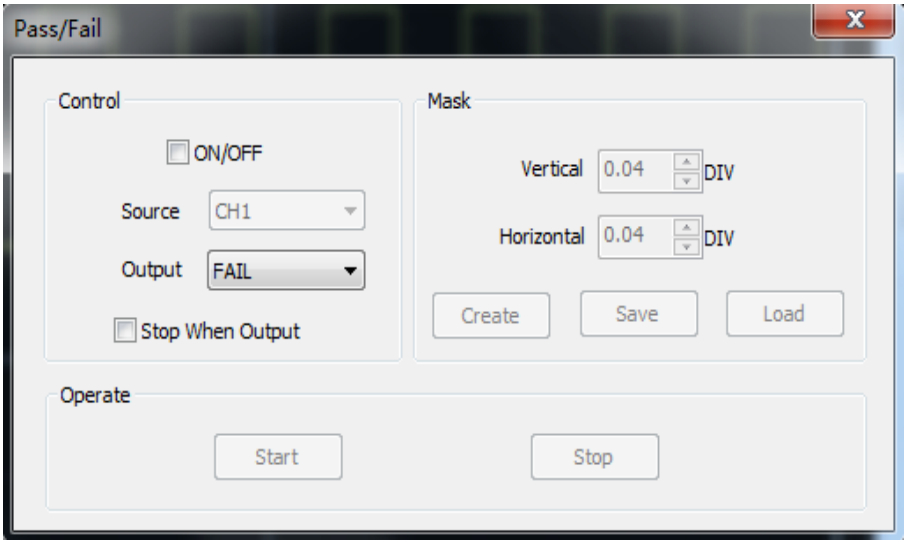
“Stop” button: Stop to record waveforms.

Clicking **“Record Scanner”** in **“Utility”** menu will play the recording data.

3.9.2 Pass/Fail

Click **“Pass/Fail”** in **“Utility”** menu.

The **Pass/Fail** window appears:



The **Pass/Fail** function monitors changes of signals and outputs pass or fail signals by comparing the input signal with the pre-created mask.

Control Setting

Source: Select the **Pass/Fail** channel

Output: Select the **Pass/Fail** output condition.

Stop When Output: If it was checked, the Pass/Fail will stop when output.

Mask Setting

Vertical: Set the vertical limit range

Horizontal: Set the horizontal limit range

"Create" button: Click this button to create Pass/Fail area according to the mask

"Save" button: Click this button to save the setups to file

"Load" button: Click this button to load the saved setups file

Information Display

P(24) F(0) T(24)

Fail: It shows the fail waveform number.

Pass: It shows the pass waveform number.

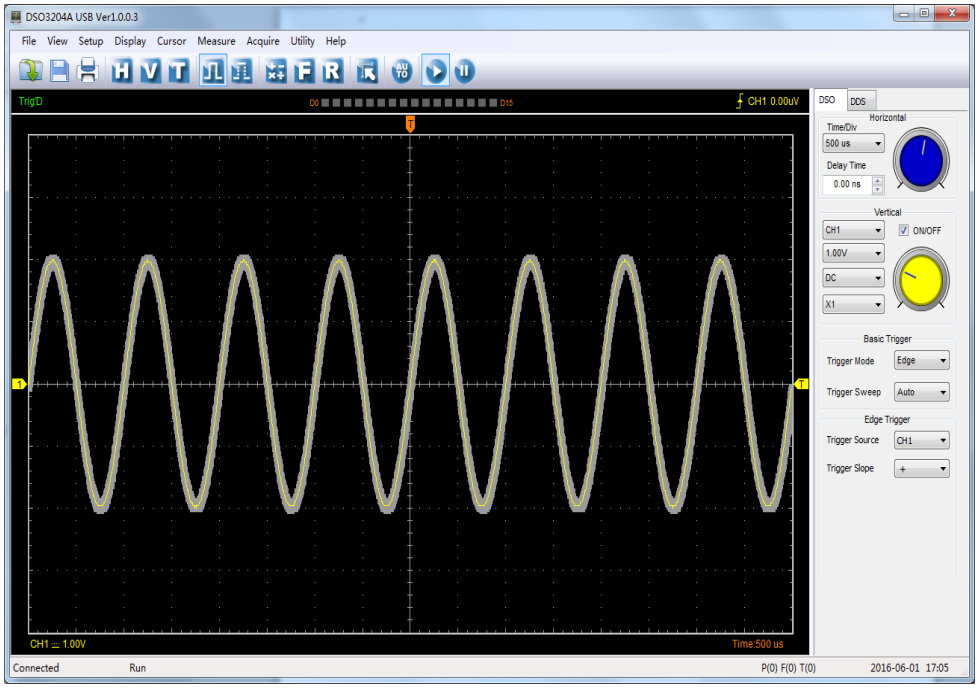
Total: It shows the total of **Pass/Fail** waveform number.

Operation

Click **"Start"** button to start the **Pass/Fail** test.

Click **"Stop"** button to stop the **Pass/Fail** test.

The Pass/Fail function display



NOTE: **Pass/Fall** function is unavailable in **X-Y** mode.

3.9.3 Self Calibration

Please refer to1.9 Self Calibration

3.9.4 Factory Setup

Click **“Factory Setup”** in **“Utility”** menu to load default setups.

When you click the **Factory Setup** in **Utility** menu, the oscilloscope displays the CH1/CH2/CH3 /CH4 waveform and removes all other waveforms.

The oscilloscope set up for normal operation when it is shipped from the factory and can be recalled at anytime by user.

The Factory Setup function does not reset the following settings:

◆ Language option
◆ Date and time

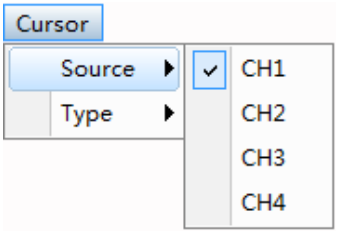
3.10 Measure Signal

3.10.1 Cursor Menu

Click **“Cursor”** in main menu.

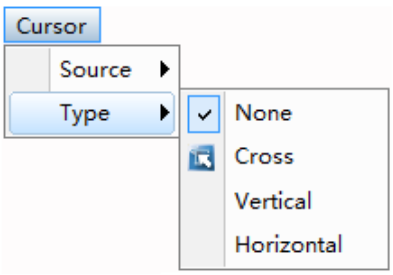
This method allows you to take measurements by moving the cursor.

1. Source



The user can set the source to **CH1**, **CH2, CH3** and **CH4**.
When you use cursors, be sure to set the **Source** to the waveform on the display that you want to measure.

2. Type

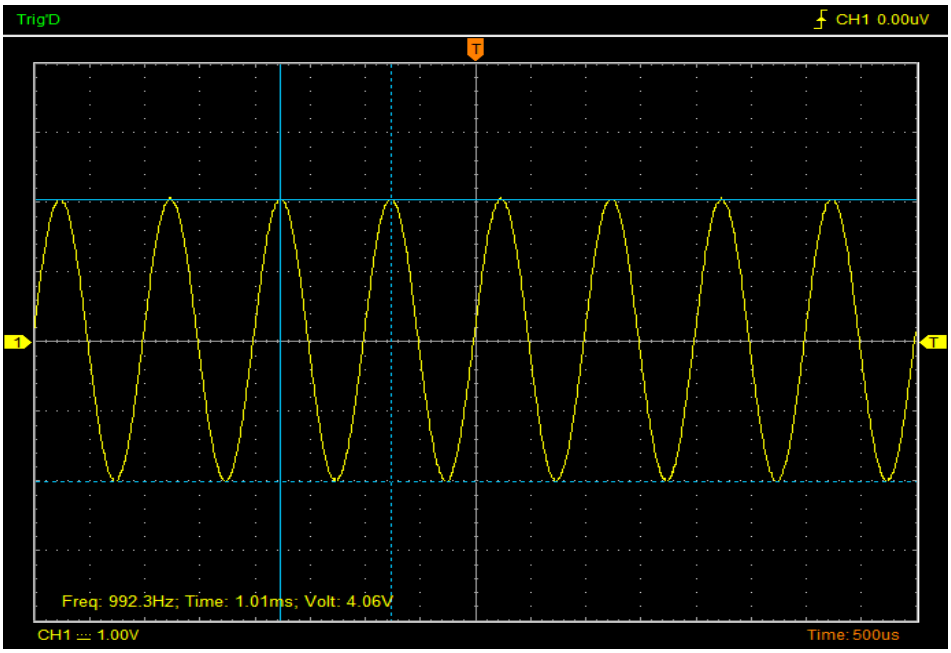


There are three types of cursors: **Cross**, **Vertical** and **Horizontal.**

1) Cross

The **Cross** cursor appears as cross lines on the display and measure the vertical and horizontal parameters.

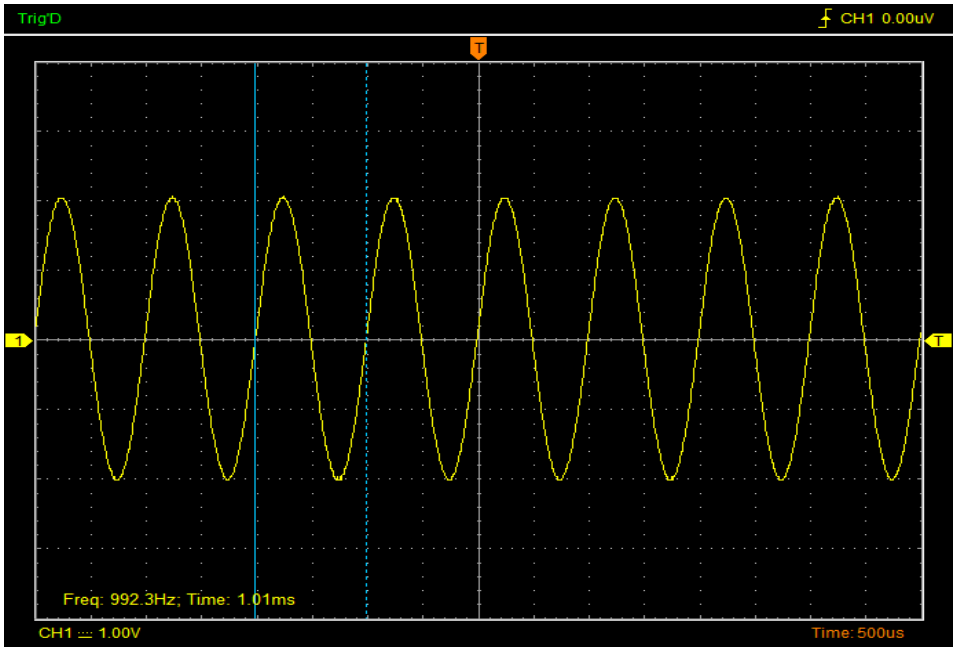
The **Cross** cursor display window:



2)Vertical

The **Vertical** cursors appear as vertical lines on the display and measure the vertical parameters.

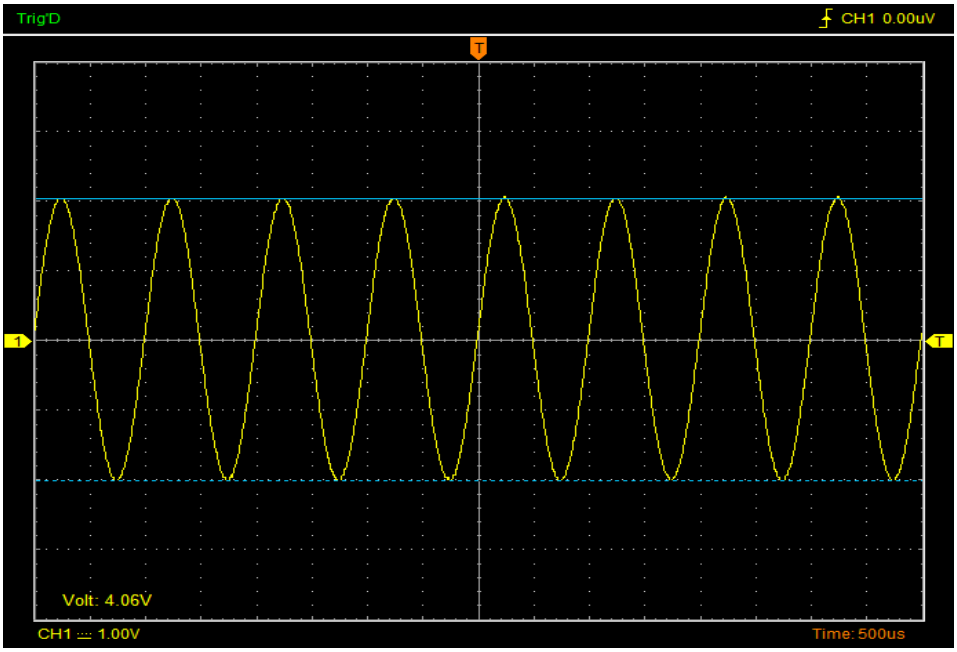
The **Vertical** cursor display window:



3)Horizontal

The **Horizontal** cursors appear as horizontal lines on the display and measure the horizontal parameters.

The **Horizontal** cursor display window:

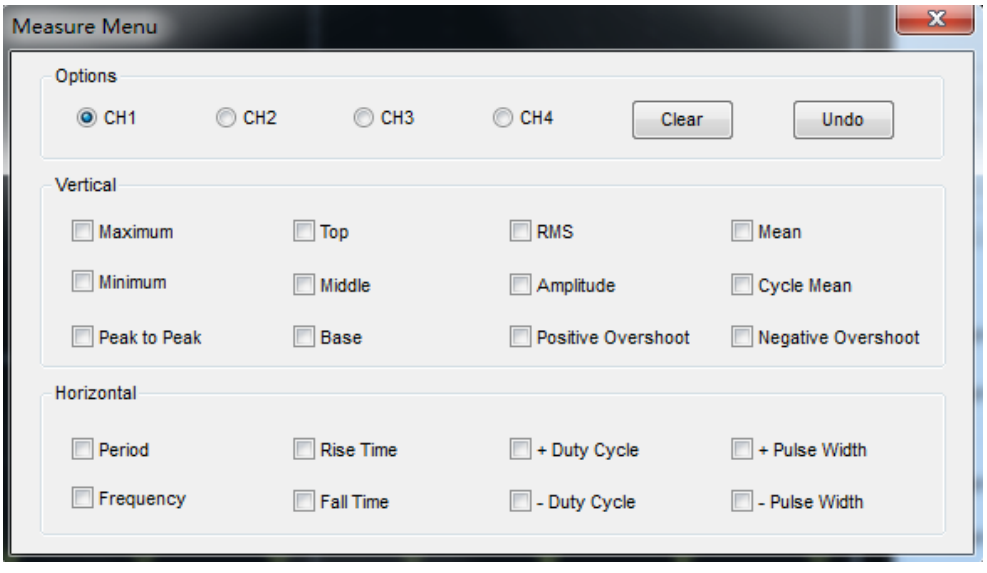


3.10.2 Measure Menu

Automatic Measurement: The oscilloscope performs all the calculations automatically in this mode. As this measurement uses the waveform record points, it is more precise than the graticule and cursor measurements. Automatic measurements show the measurement results by readouts which are periodically updated with the new data acquired by the oscilloscope.

➢Edit Measure

Click "**Measure->Edit**".



The oscilloscope provides 20 parametric auto measurements (12 voltage and 8 time measurements).

1.Options

The user can select a measure source CH1, CH2, CH3 or CH4.

2.Vertical

Maximum: Voltage of the absolute maximum level, Measured over the entire waveform

Minimum: Voltage of the absolute minimum level, Measured over the entire waveform

Peak To Peak: Peak-to-peak = Max –Min, Measured over the entire waveform

Top: Voltage of the statistical maximum level, Measured over the entire waveform

Base: Voltage of the statistical minimum level, Measured over the entire waveform

Middle: Voltage of the 50% level from base to top

RMS: The Root Mean Square voltage over the entire waveform

Amplitude: Amp = Base - Top, Measured over the entire waveform

Mean: The arithmetic mean over the entire waveform

Cycle Mean: The arithmetic mean over the first cycle in the waveform

Positive OverShoot: Positive Overshoot = (Max - Top)/Amp x 100 %, Measured over the entire waveform

Negative OverShoot: Negative Overshoot = (Base - Min)/Amp x 100 %, Measured over the entire waveform.

3.Horizontal

Period: Time to take for the first signal cycle to complete in the waveform

Frequency: Reciprocal of the period of the first cycle to complete in the waveform

Rise Time: Time taken from lower threshold to upper threshold

Fall Time: Time taken from upper threshold to lower threshold

+Duty Cycle: Positive Duty Cycle = (Positive Pulse Width)/Period x 100%, Measured of the first cycle in waveform.

-Duty Cycle: Negative Duty Cycle = (Negative Pulse Width)/Period x 100%, Measured of the first waveform.

+Pulse Width: Measured of the first positive pulse in the waveform. The time between the 50% amplitude points

-Pulse Width: Measured of the first negative pulse in the waveform. The time between the 50% amplitude points

4.Clear

Clear all measure items on display screen.

5.Undo

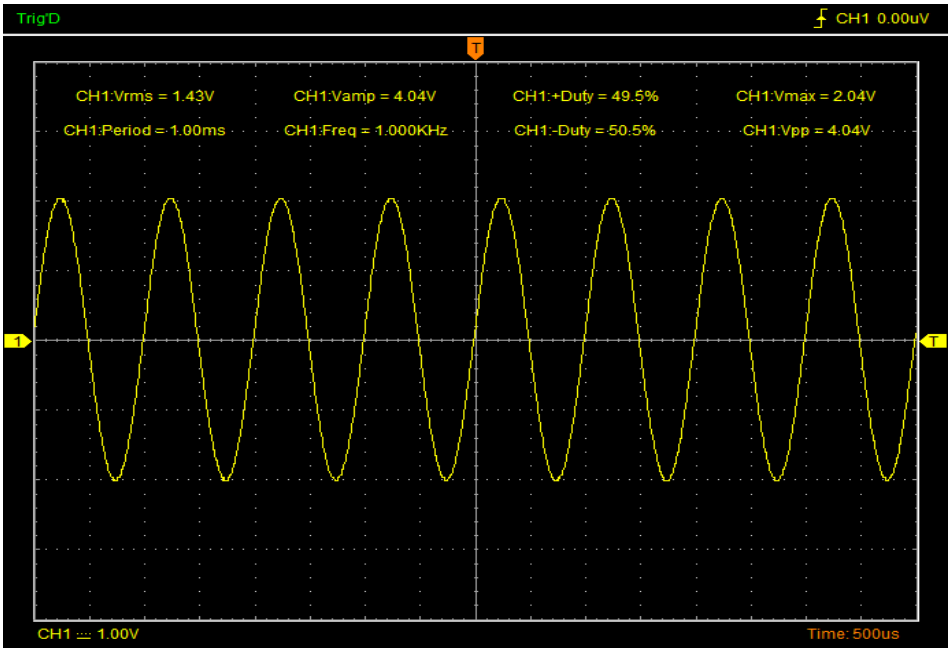
Undo all measure items on display screen.

➢Clear Measure

Click “**Measure->Clear**”.

Clear all measure items on display screen.

The **Measure** Display Window:

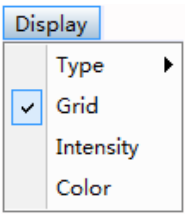


3.11 The Display System

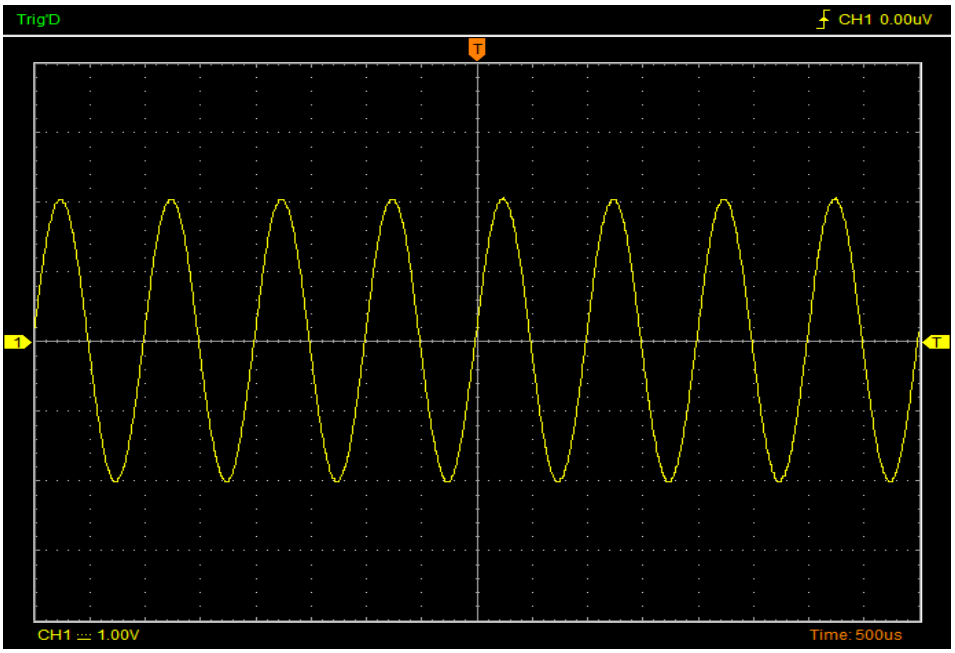
➢Display Type

Click **"Type"** in **"Display"** menu.

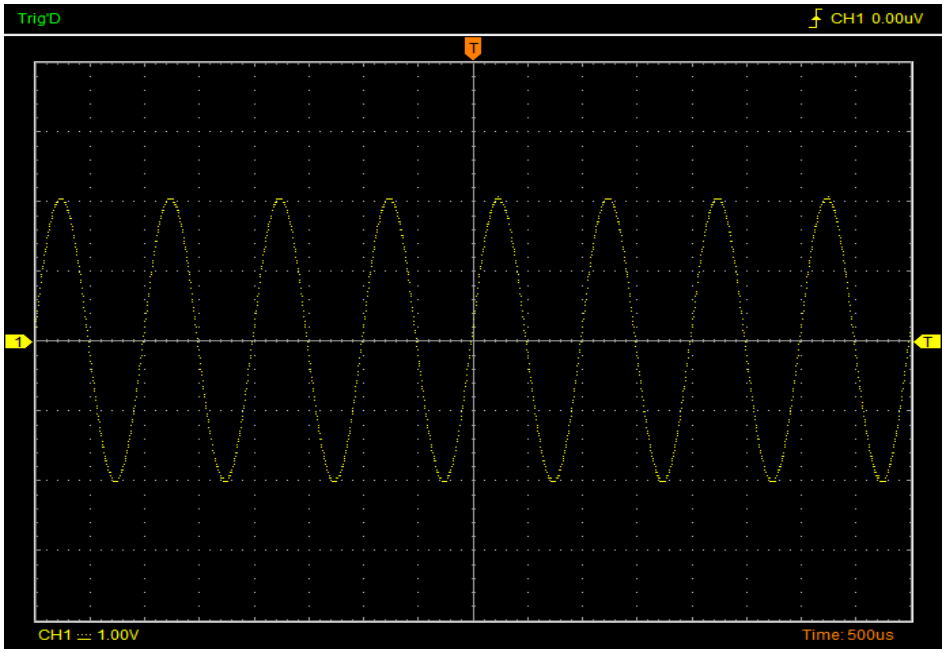
The following figure shows the type parameters setting.



If the **Vectors** type mode is selected, the waveform will be displayed as following figure.



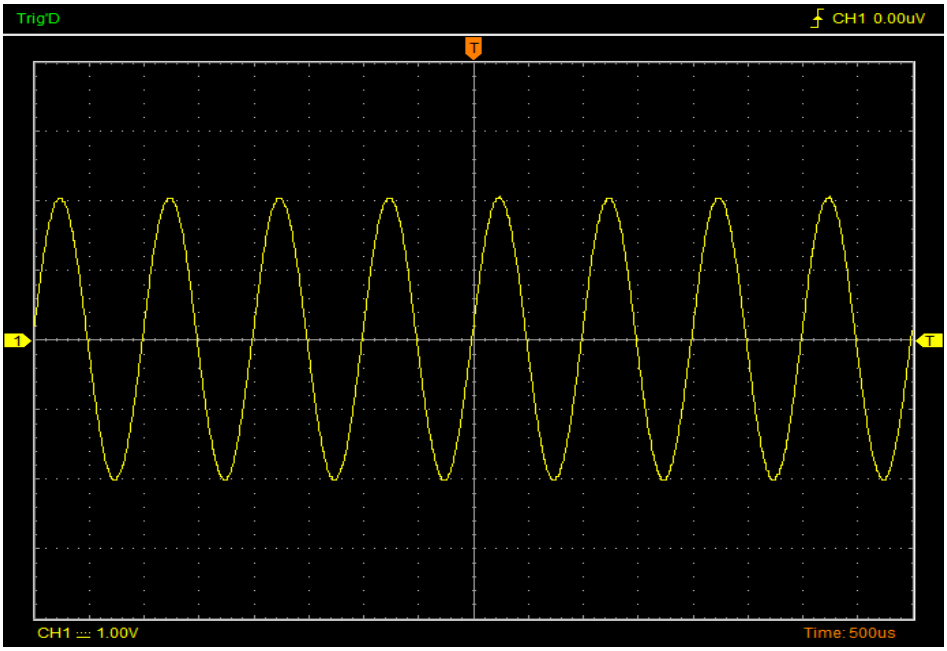
If the **Dots** type mode is selected, the waveform will be displayed as following figure.



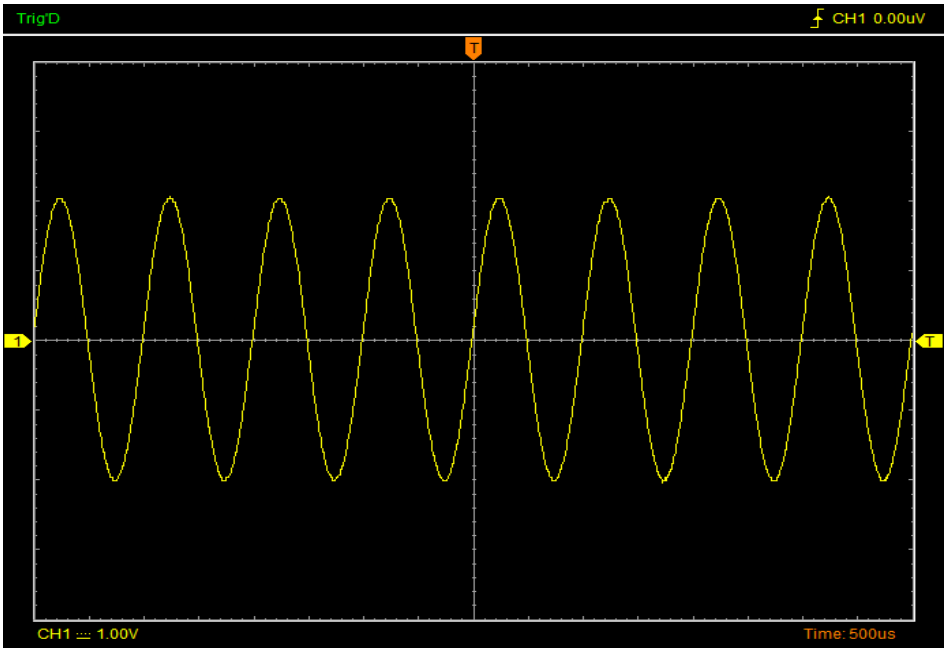
➢Display Grid

Click **"Display"** in main menu.

The grid shows:



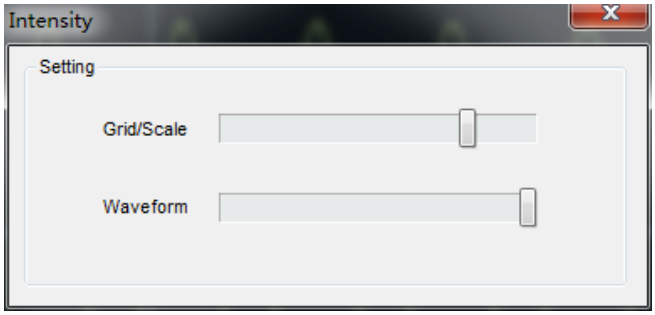
The grid not shows:



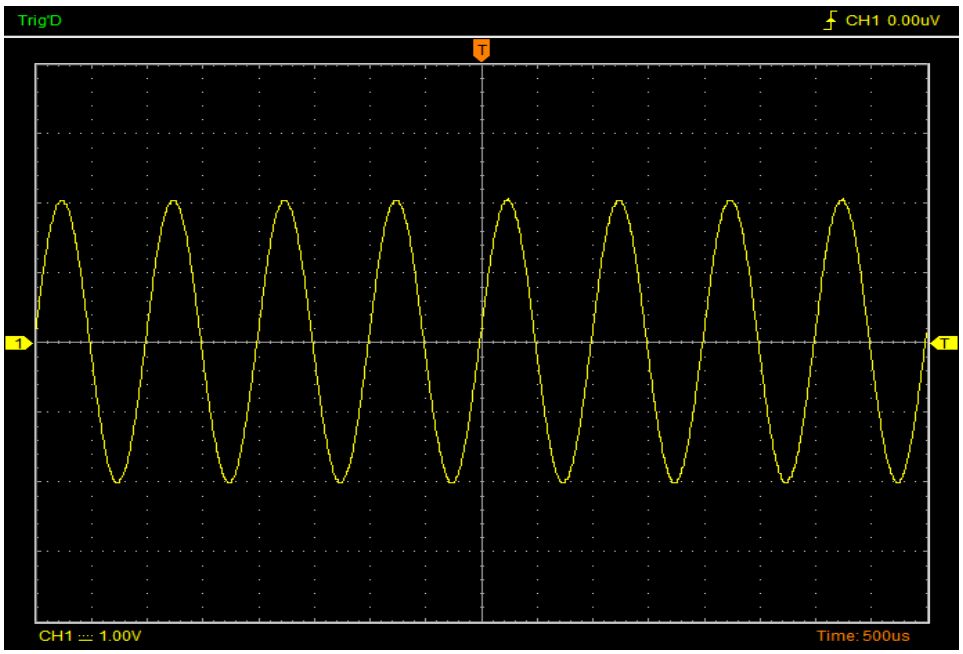
➢Intensity

Click **"Display->Intensity"** in main menu.

The following figure shows the intensity dialog. It shows the display parameters setting.



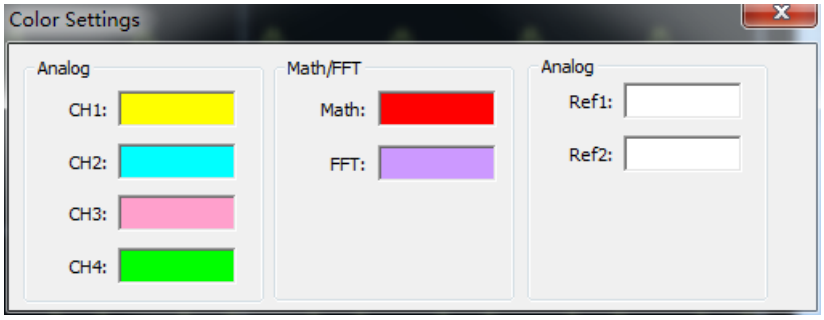
You can change the grid and waveform color intensity in this dialog.



➢Waveform Color

Click **"Display-> Color"** in main menu.

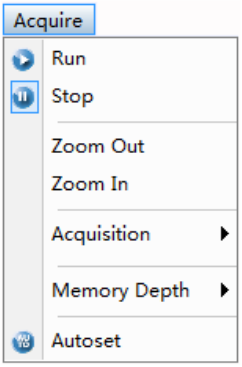
The following figure shows the Color Setting dialog. It shows the waveform color setting.



If you click the color rectangle, the color dialog will be showed:

3.12 Zoom In/Out and Move Waveforms

The software will stop updating waveform after the user clicked **“Stop”** button.
The user can change the waveform display by adjusting the scale and position. When you change the scale, the waveform display will increase or decrease in size.
The channel reference indicator identifies each waveform on the display. The indicator points to the reference level of the waveform record.

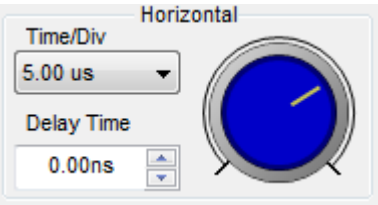


Zoom In/Out

The user can click **“Zoom In/Out”** in **“Acquire”** menu, then left click the mouse button on display screen to **zoom in/out** the waveform. Also the user can change **Time/Div** in **Horizontal** menu or in **Horizontal** panel to zoom in/out the waveform.

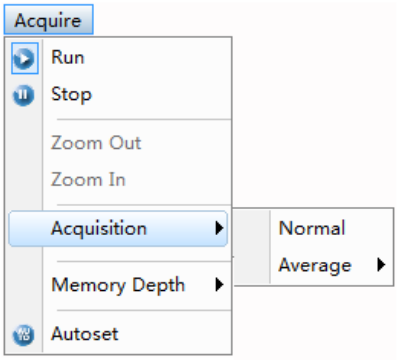
Move Waveforms

The user can change “Delay Time” on the Horizontal Panel to move the waveform.



3.13 Acquisition Modes

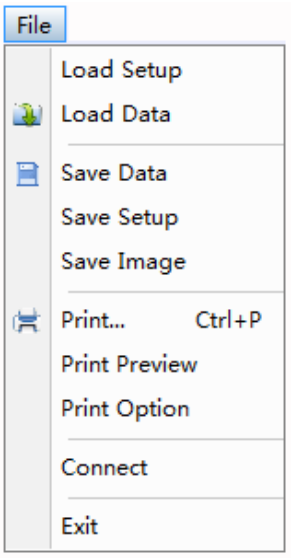
There are two acquisition modes: Normal and Average.



Normal: In this acquisition mode, the oscilloscope samples the signal in evenly spaced intervals to construct the waveform.

Average: In this acquisition mode, the oscilloscope acquires several waveforms, averages them, and displays the resulting waveform. You can use this mode to reduce random noise.

3.14 Print And Print Preview



1. Click **“Print”** in **“File”** menu to set the printer to print the current waveform.
2. Click the **“Print Preview”** in **“File”** menu to get into the Preview window.

In **“Print Preview”** window, use the **“Zoom In”** button and the **“Zoom Out”** button to change the size of the waveform graph. Click the **“Close”** button to turn this window off and click the **“Print”** button to print the report.

Chapter 4 Application Example

◆Simple Measurement

◆Capturing a Single-Shot Signal

◆The Application of the X-Y

◆Taking Cursor Measurement

4.1 Simple Measurement

To acquire and display a signal, please do the steps as follows:

1. Connect signal to **CH1** by using probe.

2. Click the button on toolbar or "**Acquire -> Autoset**" on menu.

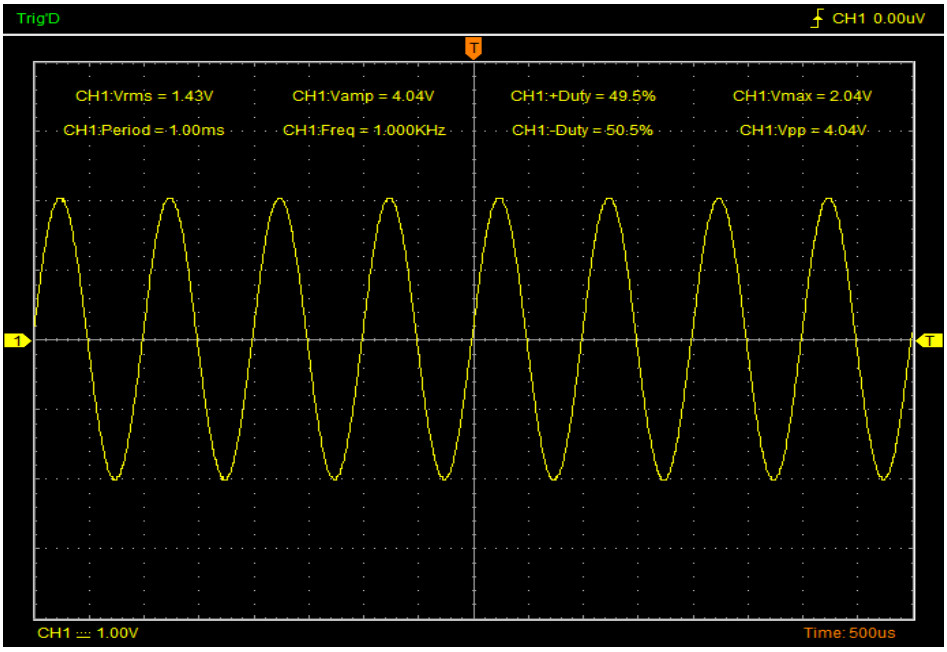
The DSO set the vertical, horizontal, and trigger controls at the best status automatically. Also, you can adjust the controls to meet your measurement to optimize the waveform display.

To measure the frequency and "**Vpp**", you can do these steps as follows:

1. Click the "**Measure Menu->Horizontal->Frequency**" button, the frequency of the signal will display on the bottom of the waveform interface.

2. Click the "**Measure Menu->Vertical->Peak-to-Peak**" button, the "**Vpp**" of the signal will also display on the bottom of the waveform interface.

To clear the measurement on the waveform interface, click the "**Measure->Clear**" button.



4.2 Capturing a Single-Shot Signal

To capture a single event, it needs to gather some pre-test knowledge of the signal in order to set up the trigger level and slope correctly. For example, if the event is derived from 3.3V COMS logic, a trigger level of 1.2 or higher Volts should work on a rising edge. Do these steps as follows:

1. Set the probe and the channel attenuations to X 10.

2. Set up the trigger in the Trigger Menu, or in the Trigger Setting window.

1) Adjust the Trigger Mode to Edge.

2) Set the Trigger Sweep to Single.

3) Set the Trigger Source to CH1.

4) Set the Trigger Slope to “+” which means you select the rising edge.

5) Adjust the Volts/Div and the time base in a proper range for the signal.

6) Drag the trigger level sign on the waveform display screen to proper position. It ally higher a little above the normal level.

7) Click button to start capturing. When the trigger conditions are met, data appears on the display representing the data points that the oscilloscope obtained with one acquisition.

This function helps to capture the signal occurrence easily, such as the noise with large amplitude; set the trigger level higher a little above the normal level and press and wait. When noise occurs, the instrument will record the waveform before and after the trigger.

4.3 The Application of the X-Y Operation

X-Y Plot acts to analyze correlation of data of two channels. Lissajous diagram is displayed in the screen when you use **X-Y** Plot, which enables to compare frequencies, amplitudes and phases of counterpart waveform against the reference waveform. This makes it possible to compare and analyze frequency, amplitude and phase between input and output.

Do these steps as follows:

1. Set the probe attenuation to “**x10**”. Set the switch to “**x10**” on the probes.

2. Connect the CH1 probe to the input of the circuit, and connect the CH2 probe to the output of the circuit.

3. Click button.

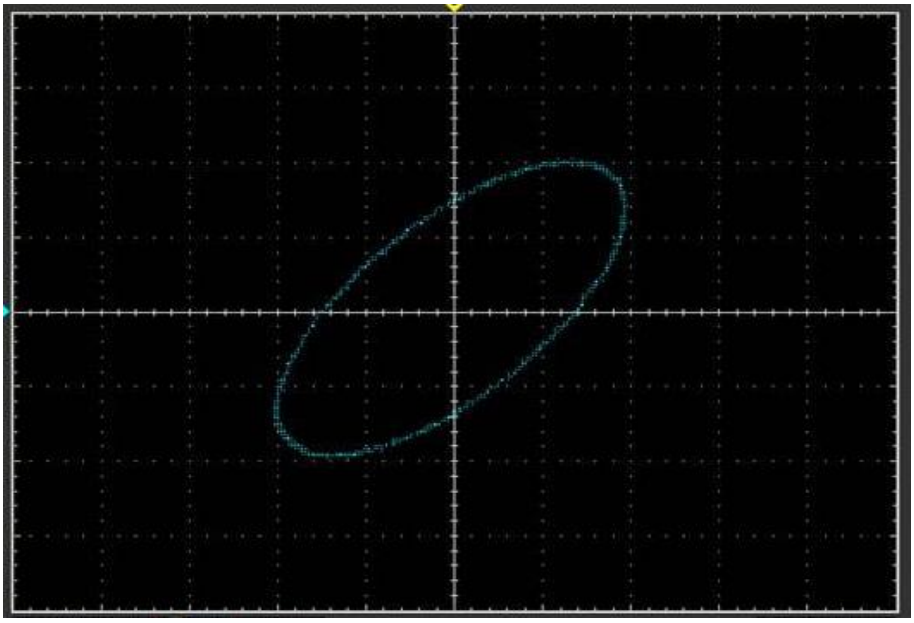
4. Adjust the vertical scale and offset to display approximately the same amplitude signals on each channel.

5. Select X-Y format at Horizontal window. The oscilloscope will displays a Lissajous pattern representing the input and the output characteristics of the circuit.

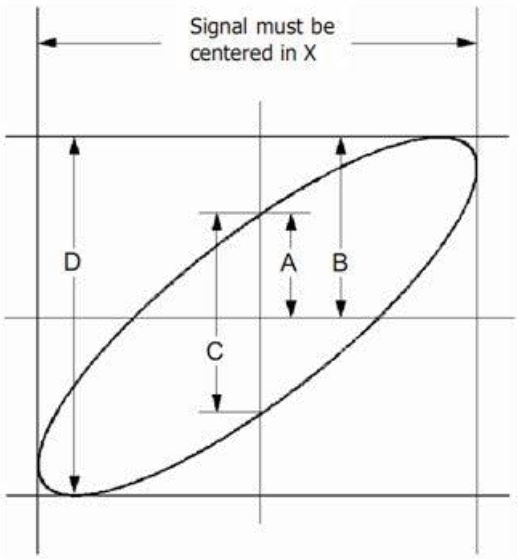
6. Adjust the scale and offset of the horizontal and vertical to a desirable waveform display.

7. Apply the Ellipse Method to observe the phase difference between the two channels.

Signal in X-Y Format:



Instruction of the Ellipse Method



Sinθ = A/B or C/D, where θ = phase shift (in degrees) between the two signals.

From the formula above:
θ **= _arcsine (A/B) or _arcsine (C/D)**

θ must be in the range of (0~π/2) or (3π/2~2π) if the main axis of the ellipse is between I and III quadrant, . If the main axis is at II and IV quadrant, θ must be in the range of (π/2~π) or (π~3π/2).

4.4 Taking Cursor Measurements

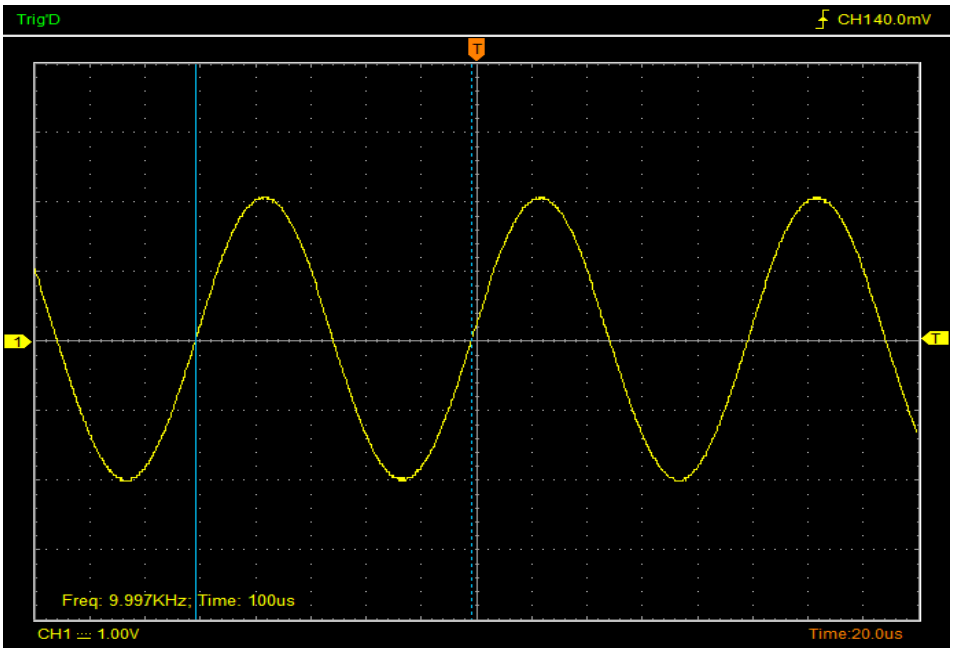
Use cursors to make time and amplitude measurements on a waveform quickly.

Measure the Peak Frequency or Time of the First Sine Waveform

Do these steps:

1. Click **"Cursor->Source"**, select CH1 (select CH2 if you want measure CH2).
2. Click **"Cursor->Type"**, select Vertical.
3. Push left mouse button, and the vertical lines appear.
4. Drag the mouse button to the point you want to measure.
5. Release the left mouse button, the frequency difference and time difference will be shown at the status bar.

Measure the Frequency and Time:

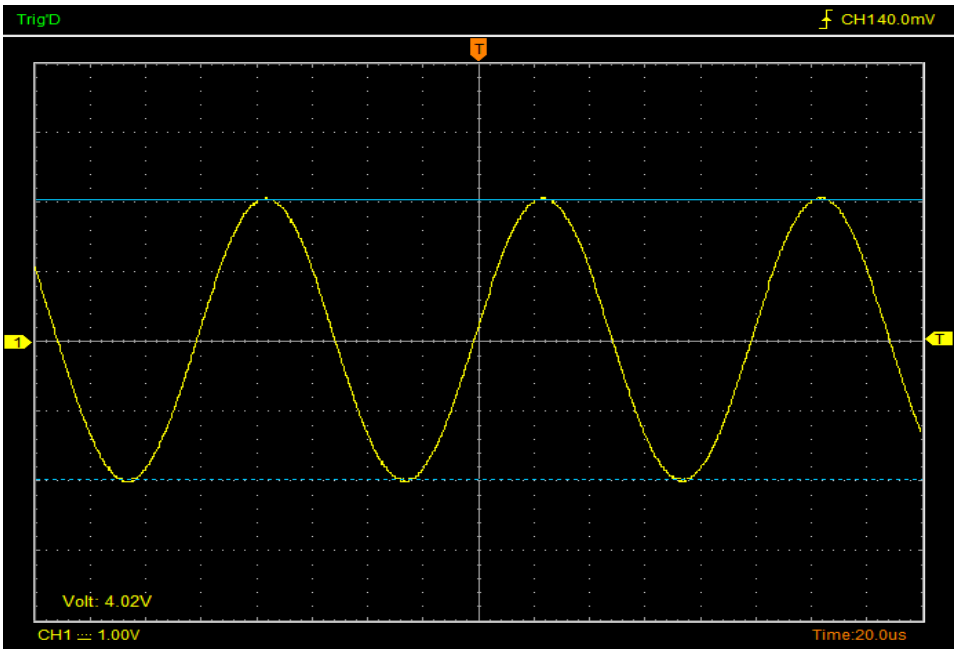


Measure the Amplitude of the First Waveform Peak of the Waveform

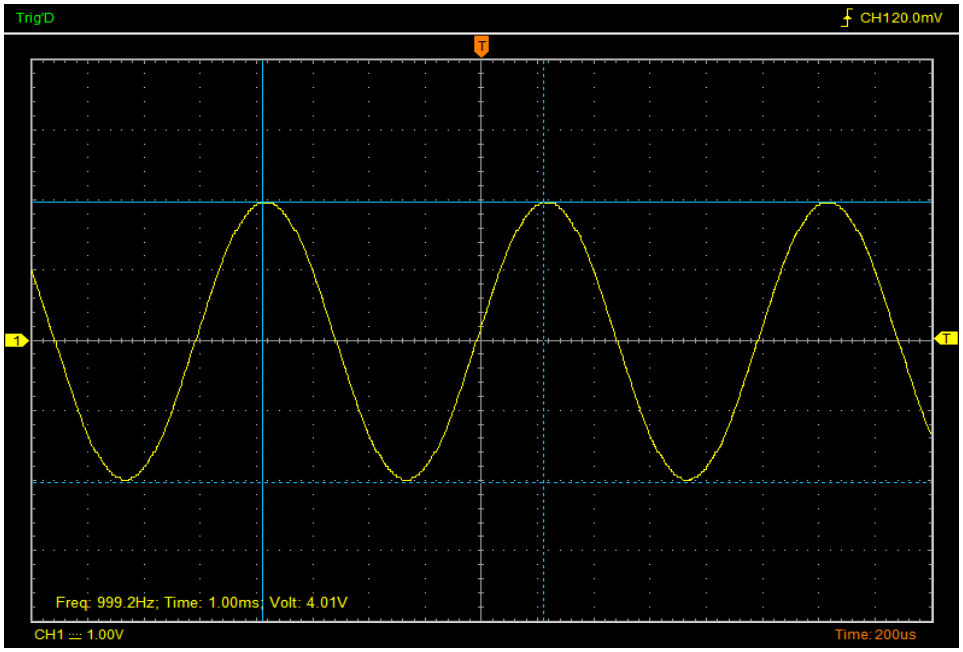
Do these steps:

1. Click "**Cursor->Source**", select CH1 (select CH2 if you want measure CH2).
2. Click "**Cursor->Type**", select Horizontal.
3. Push left mouse button, and the Horizontal lines appear.
4. Drag the mouse button to the point you want to measure.
5. Release the left mouse button, the voltage difference will be shown at the status bar.

Measure the Amplitude:



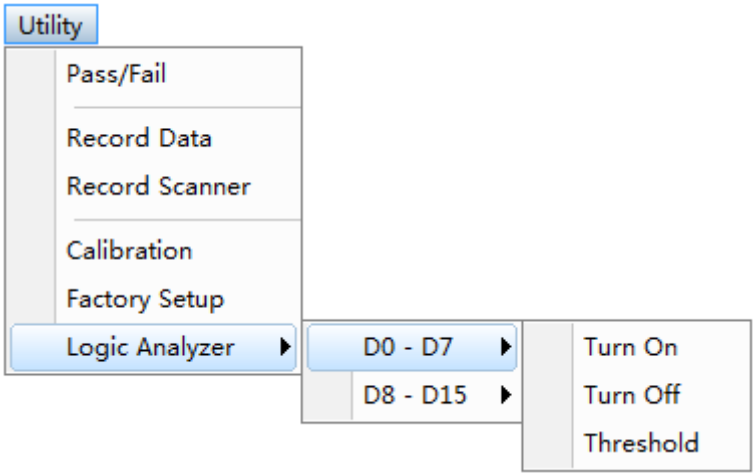
Note: Click "**Cursor->Type**", select "**Cross**", you can measure time and amplitude at one time.



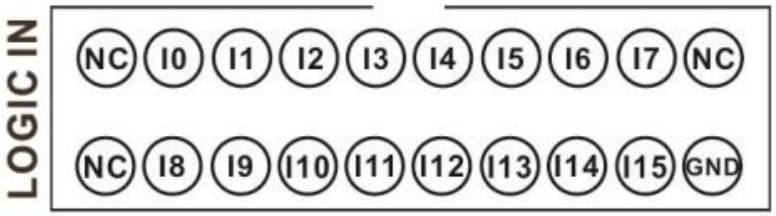
Chapter 5 Logic Analyzer Function

1. Set Bus

Click the menu “Utility -> Logic Analyzer”.



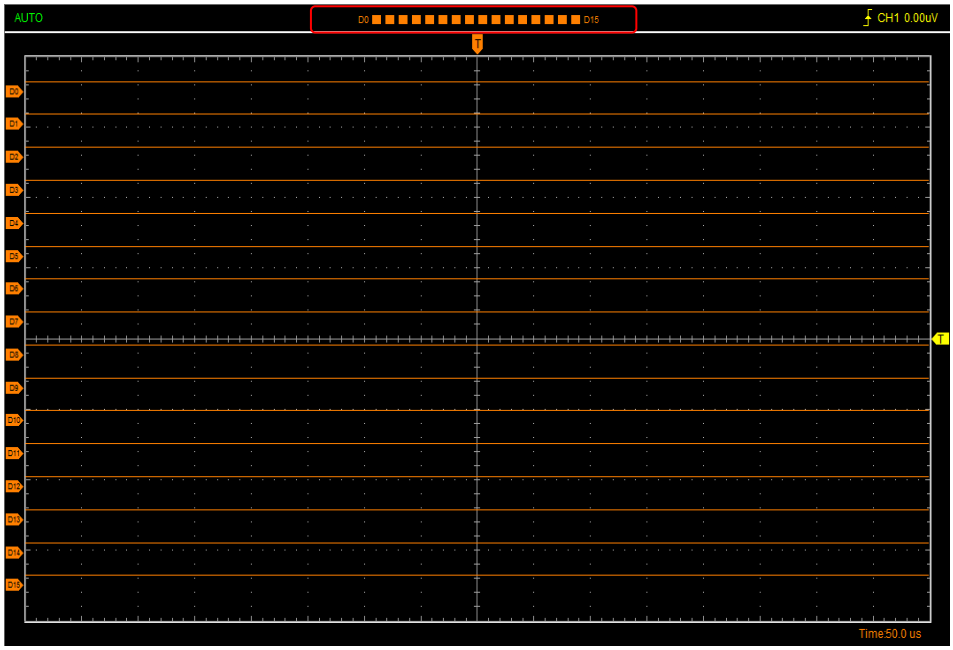
Logic Analyzer LOGIC IN ports,



DSO3000A（DSO3104A, DSO3204A, DSO3254A）has 16 signals, I0-I15, Corresponding to the software on the display is D0 - D15.

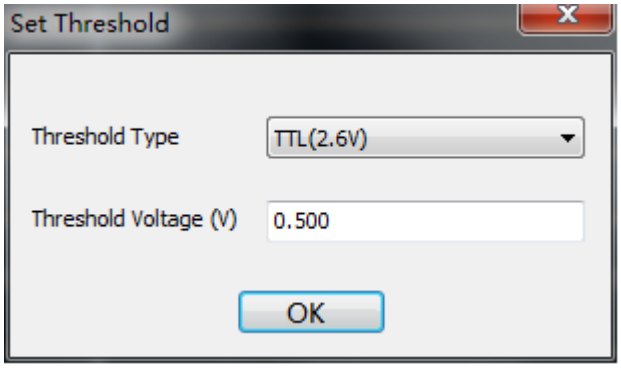
You can assign parts of them. The user can click the panes ■ under the waveform window. If the pane is orange ■, it means that you have opened it. Also you can click " Utility -> Logic Analyzer - > D0 -D7 or D8-D15" to open low eight or high eight.

As following picture:



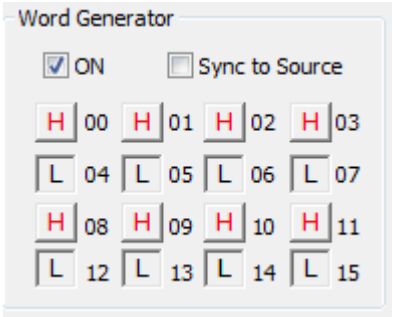
2. Set Threshold

Set TTL Threshold Voltage to 0.5V, and click “OK”.

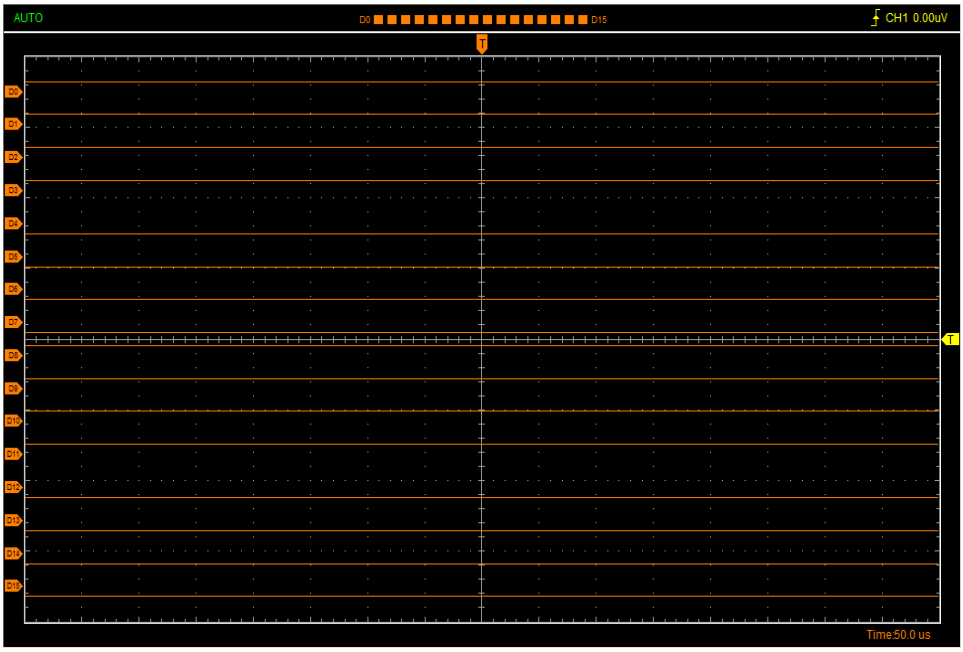


3. Logic analyzer measurement

Open Word Generator, and edit 00-15 output level HHHHLLLLHHHHLLLL.



Through the LOGIC OUT port output to the LOGIC analyzer LOGIC IN port, measurement result is shown in figure:



Use the test hooks

1. Connect logic analyzer exhaust line to the metal terminal.
2. Hook with the out signal output

Chapter 6 Waveform Generator

- Generate Waveform
- Synchronized Output
- Digital Generator

6.1 Generate Waveform

1.Generate the Sine waveform

To output a Sine Wave, please do the following steps:

1.Press the check box "Signal On" to open the wave output function.

2.Select the Signal Type "Sine ".

3.Set the Wave Parameter:

Frequency: Set the output wave frequency.

Amplitude: Set the output wave amplitude.

Y Offset: Set the output wave vertical level offset.

2.Generate the Square waveform

To output a Square Wave, please do the following Step:

1. Press the check box "Signal On" to open the wave output function.

2. Select the Signal Type "Square".

3. Set the Wave Parameters:

Frequency: Set the output wave frequency.

Amplitude: Set the output wave amplitude.

Y Offset: Set the output wave vertical level offset.

Duty: Set the duty of the output wave.

3.Generate the AM/FM waveform

To output an AM/FM Wave, please do the following Steps:

1. Press the check box "Signal On" to open the wave output function.

2. Select the Wave Type "AM/FM".

3. Set the Wave Parameters:

Frequency: Set the output wave frequency.

Amplitude: Set the output wave amplitude.

Y Offset: Set the output wave vertical level offset.

High Frequency: Set the output wave High Frequency.

Depth: Set the output wave Depth.

Max Frequency: Set the output wave Max Frequency.

FM: Change the output wave "AM" into "FM".

4.Generate the Ramp waveform

To output a Ramp Wave, please do the following steps:

1. Press the check box "Signal On" to open the wave output function.

2. Select the Wave Type "Ramp".

3. Set the Wave Parameters:

Frequency: Set the output wave frequency.

Amplitude: Set the output wave amplitude.

Y Offset: Set the output wave vertical level offset.

Duty: The duty of the output wave.

5.Generate the Trapezia waveform

To output a Trapezia wave, please do the following steps:

1. Press the check box "Signal On" to open the wave output function.

2. Select the Wave Type "Trapezia".

3. Set the Wave Parameters:

Frequency: Set the output wave frequency.

Amplitude: Set the output wave amplitude.

Y Offset: Set output wave vertical level offset.

Rise Duty: Set the output wave rise duty.

High Duty: Set the output wave high duty.

Fall Duty: Set the output wave fall duty.

6.Generate the Gaussian waveform

To output a Gaussian Wave, please do the following steps:

1. Press the check box "Signal On" to open the wave output function.

2. Select the Wave Type "Gaussian".

3. Set the Wave Parameters:

Frequency: Set the output wave frequency.

Amplitude: Set the output wave amplitude.

Y Offset: Set output wave vertical level offset.

7.Generate the Arb. waveform

To output an Arbitrary Waveform, please do the following steps:

1. Press the check box "On/Off" to open the wave output function.

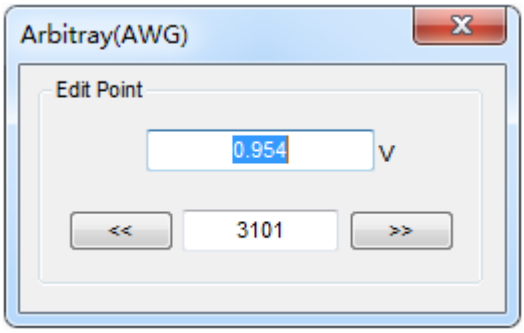
2. Select the Wave Type "Arb.".

3. Set the Wave Parameters:

Frequency: Set the output wave frequency.

4. Set the output wave.

The user can drag the mouse to draw arbitrary waveform. Also you can double click the waveform display area to open arbitrary wave editor window, and edit the voltage of every points.



After the completion of the set, click “Download” to output Arbitrary Waveform.

8.Generate the Exponent waveform

To output an Exponent Waveform, please do the following steps:

1. Press the check box "On/Off" to open the wave output function.

2. Select the Wave Type "Exponent".

3. Set the Wave Parameters:

Frequency: Set the output wave frequency.

Amplitude: Set the output wave amplitude.

Y Offset: Set the output wave vertical level offset.

Tao: Set the output wave Tao parameter.

Rise: Set the output wave slope.

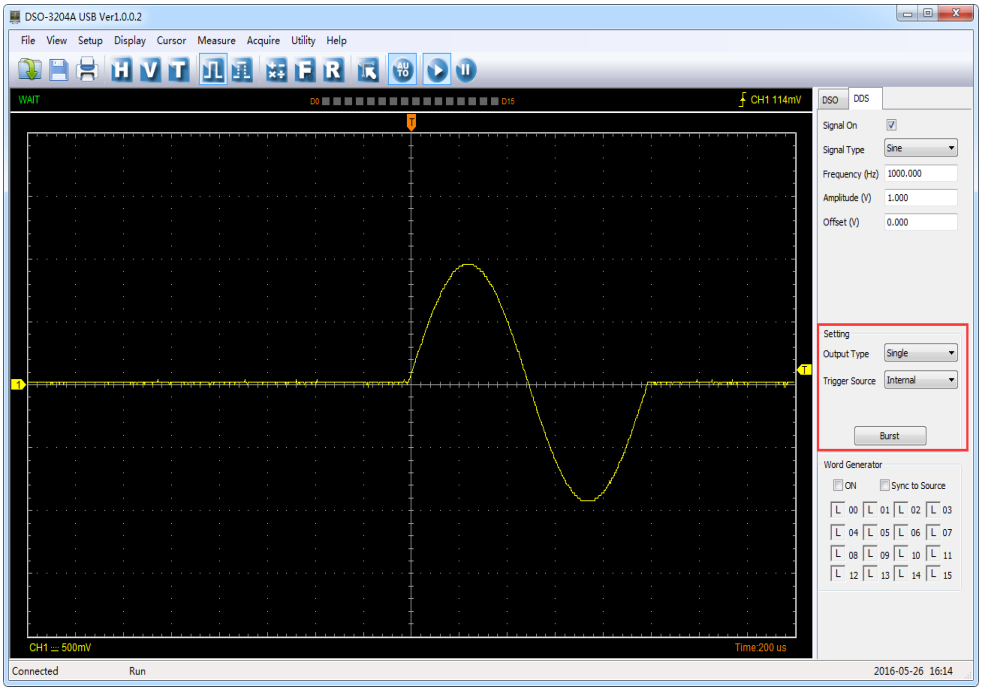
Waveform output Setting

Output type:

Single: The waveform output only once. The user selects "Single", and clicks "Burst". Each time you press, there will be output at a time.

Continue: Continue to output waveform.

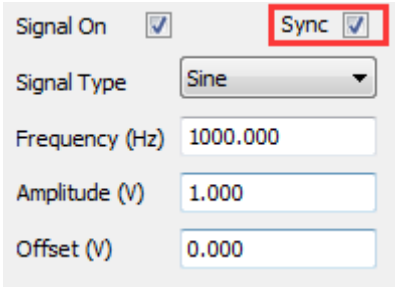
Waveform generator is set to internal and external trigger. The oscilloscope trigger mode is set to internal, that can measure waveform as follows:



6.2 Synchronized output

If you generate a waveform by software, there is a synchronized signal output from “SYNC” terminal. The signal is square waveform, the frequency of which is equal to the waveform you generated. For example, if you generated a 1 KHz, sine waveform, you will also generate an 1 KHz, square waveform simultaneously.

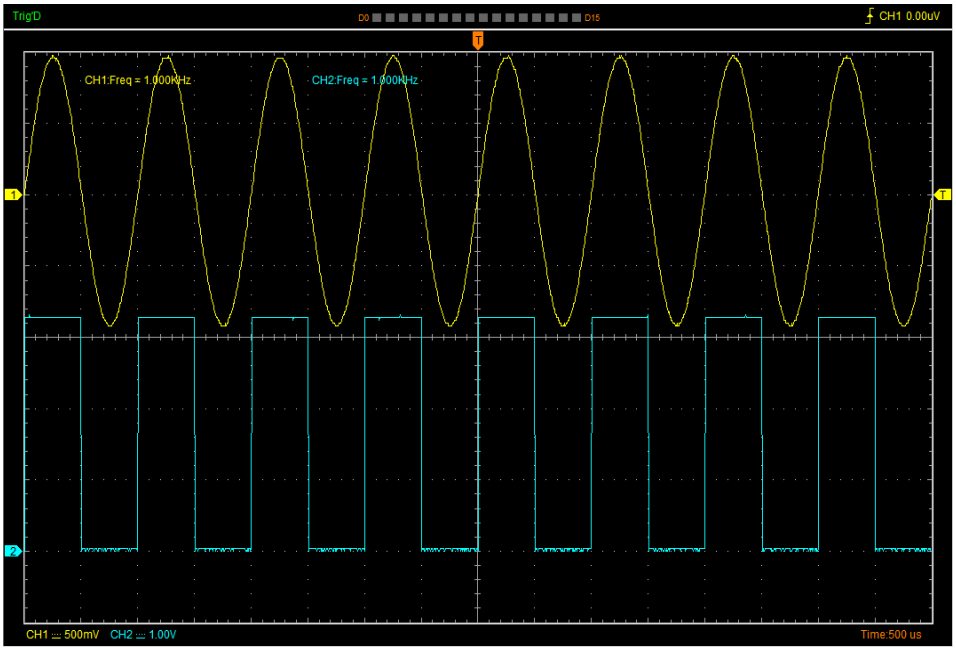
The software setting is following figure.



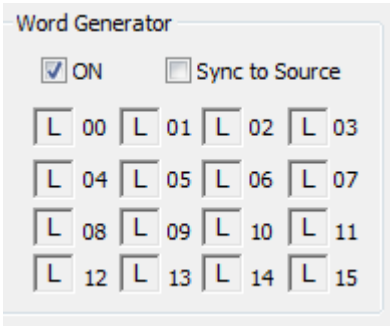
Signal On: Open signal output

Sync: Open Synchronized output

The waveform on CH1 is the sine waveform you generated from the “OUTPUT” terminal, and that on CH2 is the synchronized signal from “SYNC OUT” ports.



6.3 Digital Generator

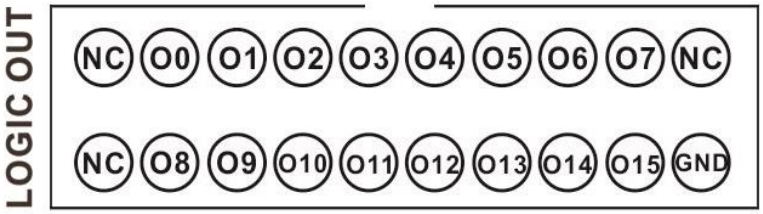


ON：Open Digital Generator

Sync to Source：Synchronized to Source, 16 bits digital output. The signal is the same to the signal from Waveform Generator OUTPUT.

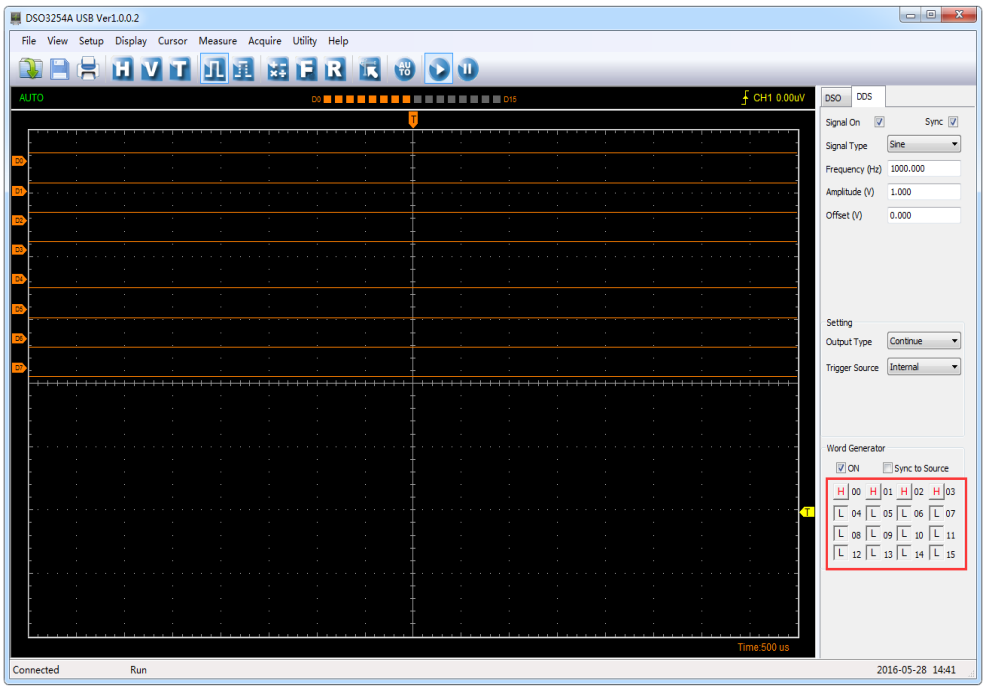
00-15：16 bits digital channel

LOGIC OUT：16 Channel Digital generator output ports:

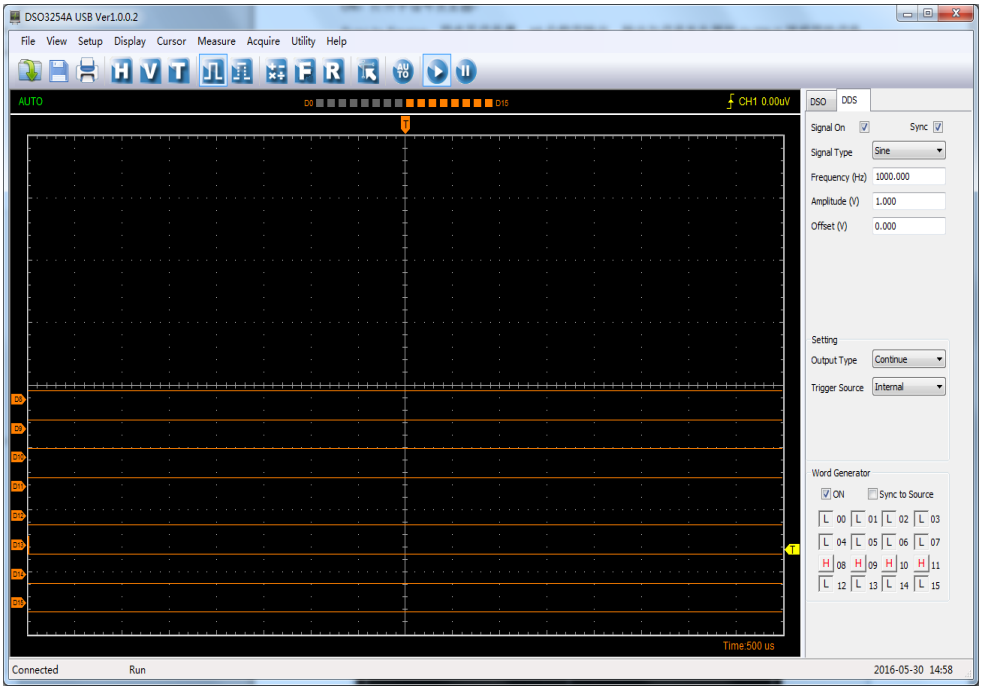


The user can edit the 00-15 high-low level, and output by LOGIC OUT port.

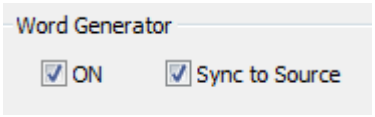
For example, set low eight to HHHHLLLL to LOGIC analyzer LOGIC IN port. The measurement result as following figure:



For example, set high eight to HHHHLLLL to LOGIC analyzer LOGIC IN port. The measurement result as following figure.

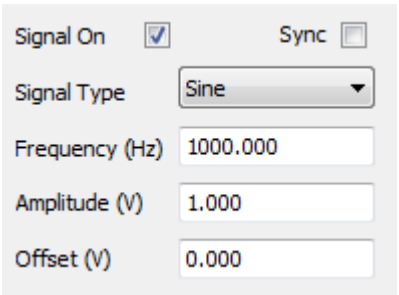


Sync to Source：Synchronized to Source

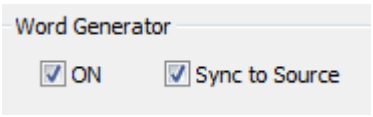


For example, measure the output of Sync to Source by LOGIC analyzer.

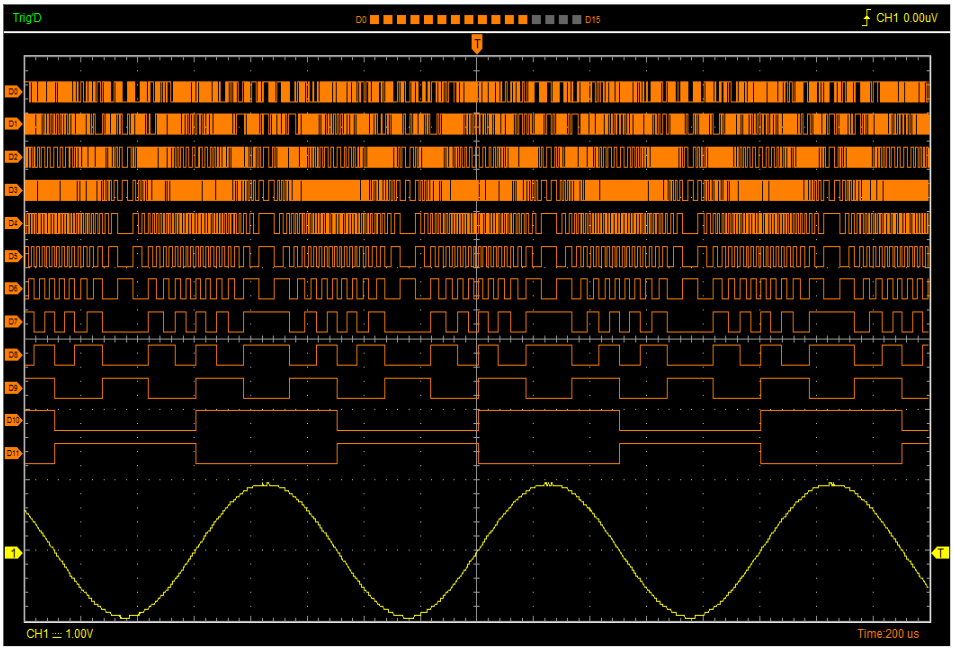
1.Open waveform output, Select the Signal Type to "Sine ", frequency to “1000Hz”, Amplitude to 1V，Y Offset to 0V。



2.Select Sync to Source



3.Connect Digital Generator LOGIC OUT of 00-11 ports to LOGIC Analyzer LOGIC IN of 00-11 ports. The measurement result as following figure:



Chapter 7 Appendix

- Appendix A: Specifications
- Appendix B: Accessories
- Appendix C: General Maintenance

Appendix A: Specifications

Specifications Table:

Model	DSO3104	DSO3104A	DSO3204	DSO3204A	DSO3254	DSO3254A
Vertical						
Analog Channel	4					
Bandwidth	100MHz		200MHz		250MHz	
Rise Time	3.5ns		1.7ns		1.4ns	
Input Impedance	Resistance: 1MΩ; Capacitance: 25 pF					
Input Sensitivity	1mV/div to 10V/div					
Input Coupling	AC/DC/GND					
Vertical Resolution	8 bits					
Memory Depth	1.6K-128M/CH(1.6K, 16K, 160K, 1.6M, 16M, 32M, 64M, 128M)					
Input Protection	400V (DC+AC Peak)					
Horizontal						
Real-Time Sampling Rate	1GSa/s					
Time Base Range	2ns/div to 1000s/div					
Time Base Precision	±50ppm					
Trigger						
Source	CH1, CH2, CH3, CH4, EXT/10					
Mode	Edge, Pulse, Video, Slope and Timeout					
Type	Single, Auto, Normal					
Voltage Measurement	Vpp, Vamp, Vmax, Vmin, Vtop, Vmid, Vbase, Vavg, Vrms, Vcrms, Preshoot, Overshoot, Frequency, Period, Rise Time, Fall Time, Positive Width, Negative Width, Duty Cycle					
Cursors Measurement	Horizontal , Vertical, Cross					
Waveform Signal Process	+,- , x,÷, FFT, Invert					
Voltage Range	1mV to 10V/div @ x 1 probe; 10mV to 100V/div @ x 10 probe;					
	100mV to 1KV/div @ x 100 probe; 1V to10KV/div @ x 1000 probe;					
FFT	Rectangular, Hanning, Hamming, Blackman Window					
Logic Analyzer						
Channel	--	16CH	--	16CH	--	16CH
High input impendence	--	200KΩ (C=10pF)	--	200KΩ (C=10pF)	--	200KΩ (C=10pF)
Input Voltage range	--	-60V~60V	--	-60V~60V	--	-60V~60V

Max Sample Rate	--	250MSa/s	--	250MSa/s	--	250MSa/s
Bandwidth	--	10MHz	--	10MHz	--	10MHz
Compatible input	--	TTL,LVTTL CMOS,	--	TTL,LVTTL CMOS,	--	TTL,LVTTL CMOS,
	--	LVCMOS, ECL. PECL,EIA	--	LVCMOS, ECL PECL,EIA	--	LVCMOS, ECL PECL,EIA
Storage depth	--	1.6K~64M	--	1.6K~64M	--	1.6K~64M
Waveform Generator Mode						
Waveform Frequency	--	DC~25MHz	--	DC~25MHz	--	DC~25MHz
DAC	--	2K~200MHz adjustable	--	2K~200MHz adjustable	--	2K~200MHz adjustable
Frequency Resolution	--	0.10%	--	0.10%	--	0.10%
Channel	--	1CH	--	1CH	--	1CH
Waveform Depth	--	4K	--	4K	--	4K
Vertical Resolution	--	12bits	--	12bits	--	12bits
Frequency Stability	--	<30ppm	--	<30ppm	--	<30ppm
Wave Amplitude	--	±3.5V Max.	--	±3.5V Max.	--	±3.5V Max.
Output Impedance	--	50 Ω	--	50 Ω	--	50 Ω
Output Current	--	50mA	--	50mA	--	50mA
System BW	--	25M	--	25M	--	25M
Interface	USB 2.0					
Power Source	12--36V Wide range of input voltage					
Volume	255 x 190 x 45 (mm)					
Weight	1Kg					

Appendix B: Accessories

DSO3104, DSO3204, DSO3254

◆ Probe×4 (1.5m), 1:1, (10:1) Passive Probes

◆ A power adapter

◆ A USB Cable

◆ A PC software CD of the oscilloscope

DSO3104A, DSO3204A, DSO3254A

◆ Probe×4 (1.5m), 1:1, (10:1) Passive Probes

◆ A power adapter

◆ A USB line

◆ A BNC test line

◆ Two 20-pin logic analyzer exhaust lines

◆ A bag(18) of little test hook Logic analyzer with high-quality test hook

◆ A PC software CD of the oscilloscope

Appendix C: General Maintenance

General Care

Do not store or leave the oscilloscope where the device will be exposed to direct sunlight for long periods of time.

Caution

To avoid damages to the device or probes, do not expose them to sprays, liquids or solvents.

To avoid damages to the surface of the device or probes not use any abrasive or chemical cleaning agents.

Cleaning

Inspect the device and probes as often as operating conditions require. Make sure the device disconnect form all power sources.

To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the oscilloscope and probes with a lint-free cloth. Use care to avoid scratching the clear glass display filter.

2. Use a soft cloth dampened with water to clean the device.