SEALEY Professional TOOLS

AUTO SERVICE LINE

TA4000

AUTOMOTIVE DIAGNOSTIC OSCILLOSCOPE 4 CHANNEL

Original Language Version

TA4000 | Issue: 1 - 06/09/11

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NOTE: *It is our policy to continually improve products and as such we reserve the right to alter data, specifications and component parts without prior notice.*
IMPORTANT: No liability is accepted for incorrect use of this product.
WARRANTY: Guarantee is 12 months from purchase date, proof of which will be required for any claim.
INFORMATION: For a copy of our latest catalogue and promotions call us on 01284 757525 and leave your full name and address, including postcode.

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SEALEY Professional TOOLS AUTO SERVICE LINE

Sole UK Distributor, Sealey Group,
Kempson Way, Suffolk Business Park,
Bury St. Edmunds, Suffolk,
IP32 7AR

01284 757500
01284 703534
www.sealey.co.uk
sales@sealey.co.uk

Safety Summary

1. ELECTRICAL SAFETY

❒ **WARNING!** It is the responsibility of the owner and the operator to read, understand and comply with the following:
You must check all electrical products, before use, to ensure that they are safe. You must inspect power cables, plugs, sockets and any other connectors for wear or damage. You must ensure that the risk of electric shock is minimised by the installation of appropriate safety devices. A Residual Current Circuit Breaker (RCCB) should be incorporated in the main distribution board. We also recommend that a Residual Current Device (RCD) is used. It is particularly important to use an RCD with portable products that are plugged into a supply which is not protected by an RCCB. If in any doubt consult a qualified electrician. You may obtain a Residual Current Device by contacting your Sealey dealer.
You must also read and understand the following instructions concerning electrical safety.

1.1. The **Electricity at Work Act 1989** requires all portable electrical appliances, if used on business premises, to be tested by a qualified electrician, using a Portable Appliance Tester (PAT), at least once a year.

1.2. The **Health & Safety at Work Act 1974** makes owners of electrical appliances responsible for the safe condition of those appliances and the safety of the appliance operators. **If in any doubt about electrical safety, contact a qualified electrician.**

1.3. Ensure that the insulation on all cables and on the appliance is safe before connecting it to the power supply. See 1.1.1. and 1.1.2. and use a Portable Appliance Tester.

1.4. Ensure that cables are always protected against short circuit and overload.

1.5. Regularly inspect transformer plug for wear or damage.

1.6. **Important:** Ensure that the voltage marked on the appliance matches the power supply to be used.

1.7. **DO NOT** pull the plug from the socket by the cable.

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

1.9. **DO NOT** connect or disconnect probes or test leads whilst they are connected to a voltage source.

1.10. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for rating information before making connections to the product. To avoid shock hazard, use a correctly rated probe for your measurement.

1.11. Protect the oscilloscope from electro-magnetic fields, static electricity and high temperatures.

1.12. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for rating information before making connections to the product.

1.13. **DO NOT** touch exposed connections and components when power is on.

1.14. 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.

2. GENERAL SAFETY

✓ Familiarise yourself with the applications, limitations, and potential hazards of the oscilloscope.

✓ Keep the oscilloscope clean and in good condition.

✓ Use adequate ventilation. Refer to the installation instructions for proper ventilation of the device.

✓ Remain vigilant when using the oscilloscope on, or near, machinery where there are rotational parts such as belts, pulleys and fans.

✓ Remove ill fitting clothing. Remove ties, watches, rings, and other loose jewellery, and contain and/or tie back long hair.

✓ Maintain correct balance and footing. Ensure the floor is not slippery and wear non-slip shoes.

✓ Keep Product Surfaces Clean and Dry.

✗ **DO NOT** use the oscilloscope if damage is suspected. If suspected damage occurs with the device, have it inspected by qualified service personnel before further operations.

✗ **DO NOT** get the oscilloscope wet or use in damp or wet locations or areas where there is condensation.

✗ **DO NOT** use the oscilloscope for any purpose other than for which it is designed.

✗ **DO NOT** allow untrained persons to operate the oscilloscope.

✗ **DO NOT** operate the oscilloscope when you are tired or under the influence of alcohol, drugs or intoxicating medication.

✗ **DO NOT** operate in a potentially explosive environment/atmosphere.

❒ **WARNING:** ***The warnings, cautions and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood that common sense and caution are factors which cannot be built into this product, but must be applied by the operator.***

Chapter 1 Getting Started

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

- System Requirements
- Install your product
- General Features
- General Check
- Perform a probe check and compensate probes
- Match your probe attenuation factor
- Use the self calibration routine
- Accessories

System Requirement

To run the oscilloscope software, your computer needs the following secification:

Minimum System Requirements

Operating System
Window NT/2000/XP/VISTA/Win7

Processor
Upwards of 1.00G processor

Memory
256MB

Disk Space
500MB disc free space

Screen resolution
800 x 600 pixels

Recommended Configuration

Operating System:
Windows XP SP3 Syst**em**

Processor
2.4GB Processor

Memory
1GB Memory

Disk Space
80GB Disc Space

Screen resolution
1024 x 768 or 1280 x 1024 pixel resolution

DPI Setting
Normal Size (96DPI)

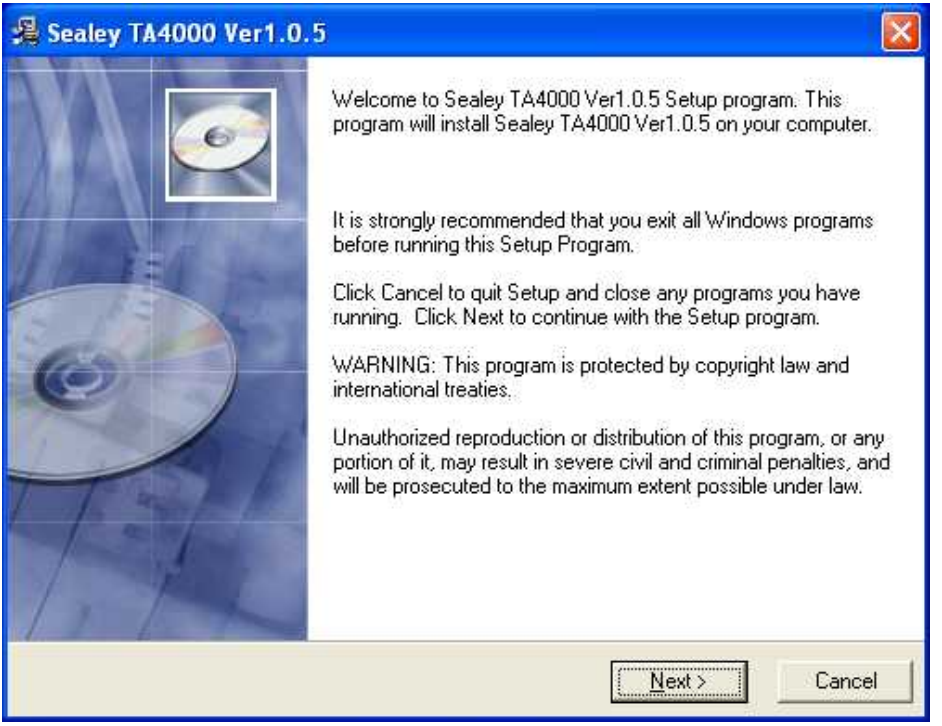
Install Software

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

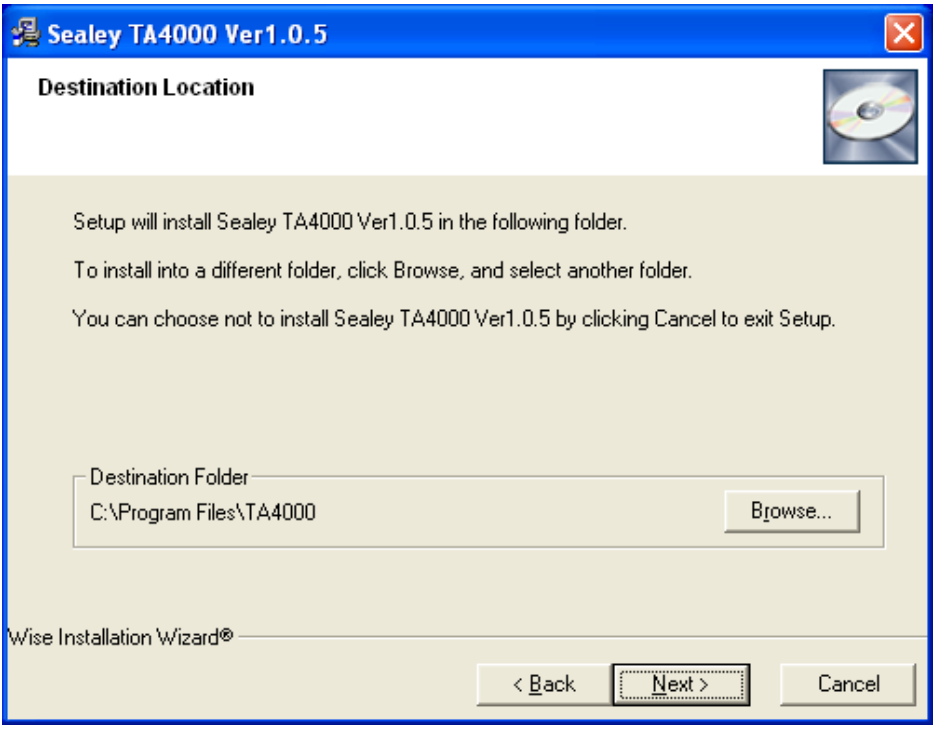
1. Whilst in Windows, insert the installation CD into the CD-ROM drive.

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

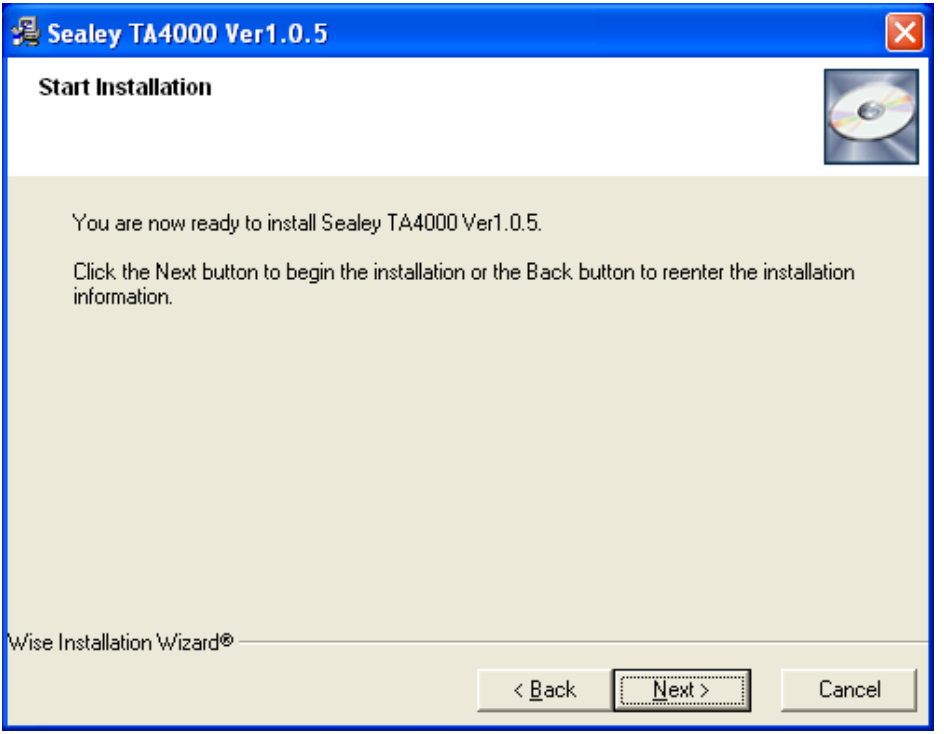
3. When the software Installation has started. Click 'Next' to continue.



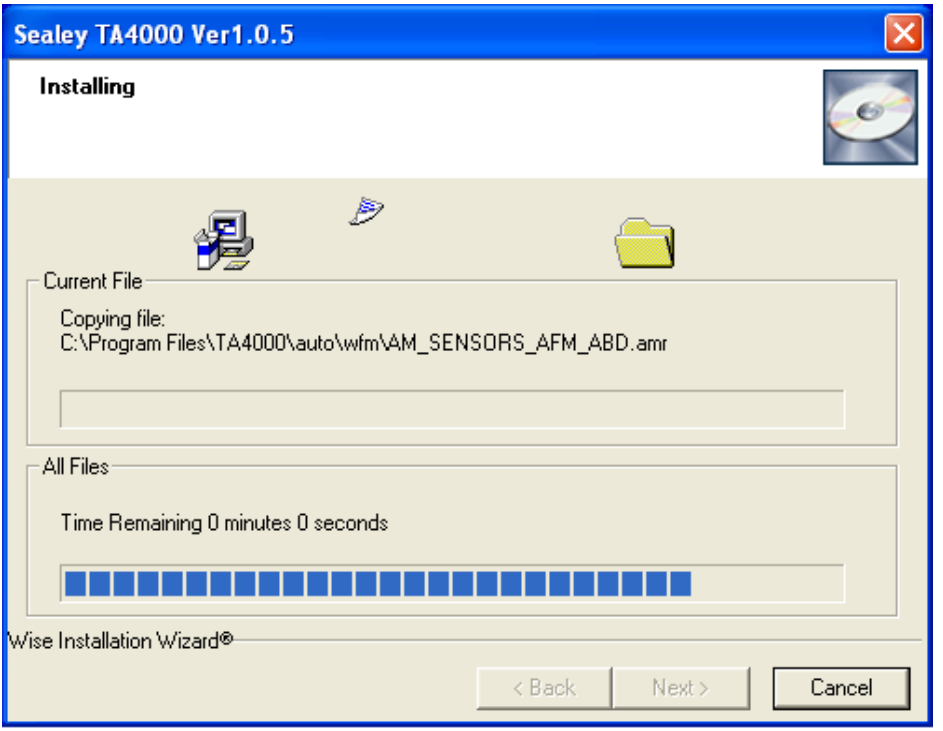
4. Choose a destination directory. Click 'Next' to continue.



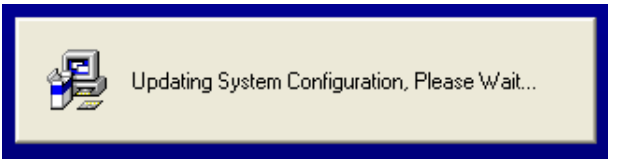
5. Check the setup information. Click 'Next' to start copying of files.



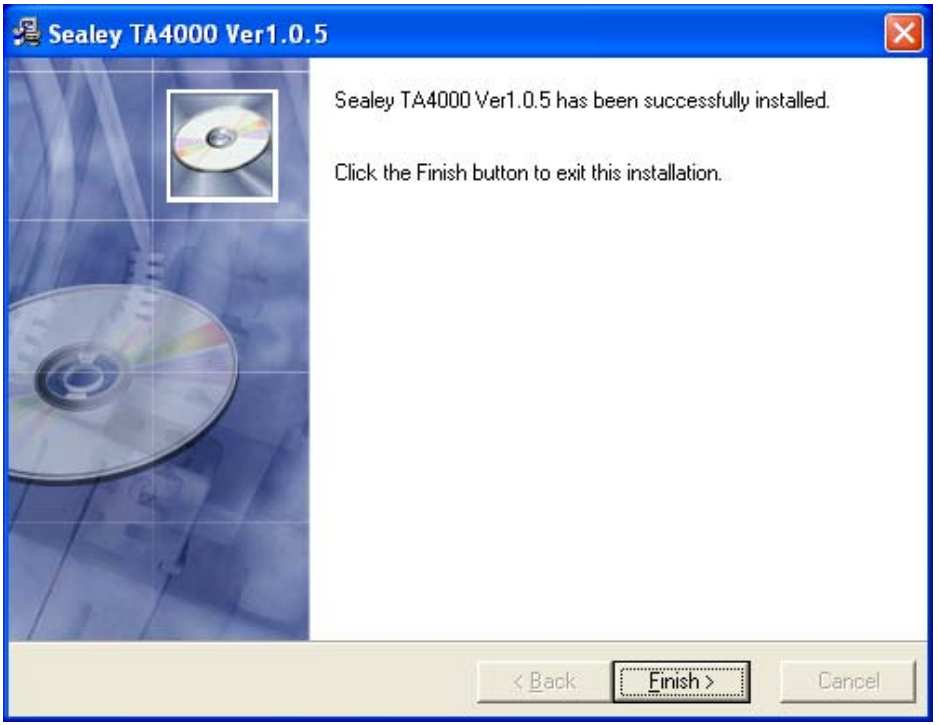
6. This Status dialog is displayed during copying of files.



7. Updating Your System Configuration.



8. The installation is complete.


Sealey TA4000 Ver1.0.5
Sealey TA4000 Ver1.0.5 has been successfully installed.
Click the Finish button to exit this installation.
< Back
Finish >
Cancel

Install Driver

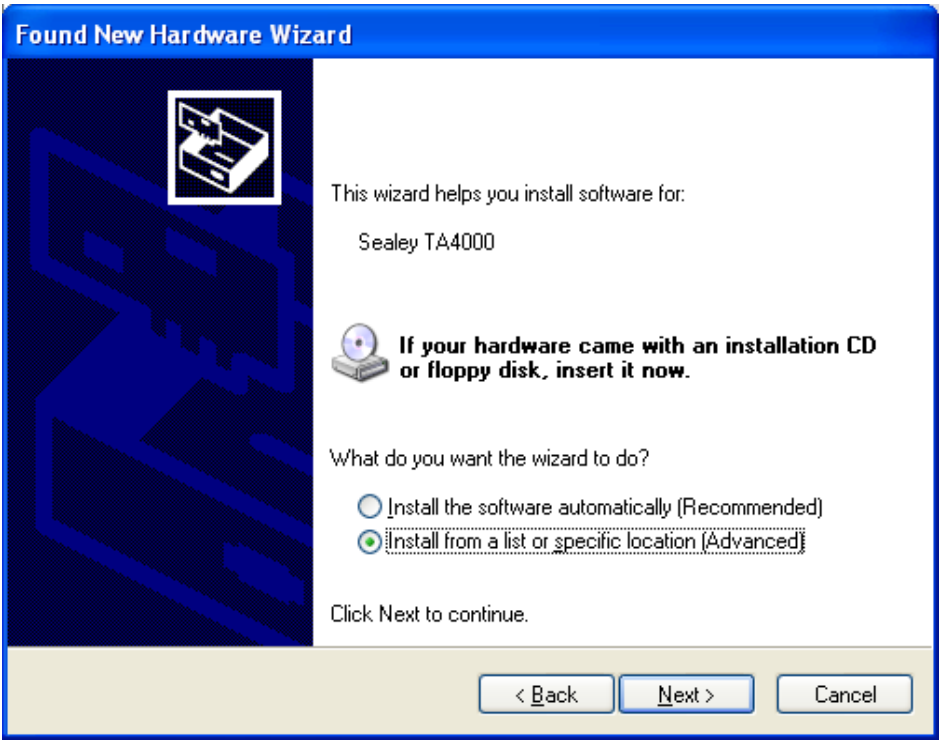
Example: **TA4000** USB

1. Connect the A-Type Plug of the USB cable to your PC'S USB port.

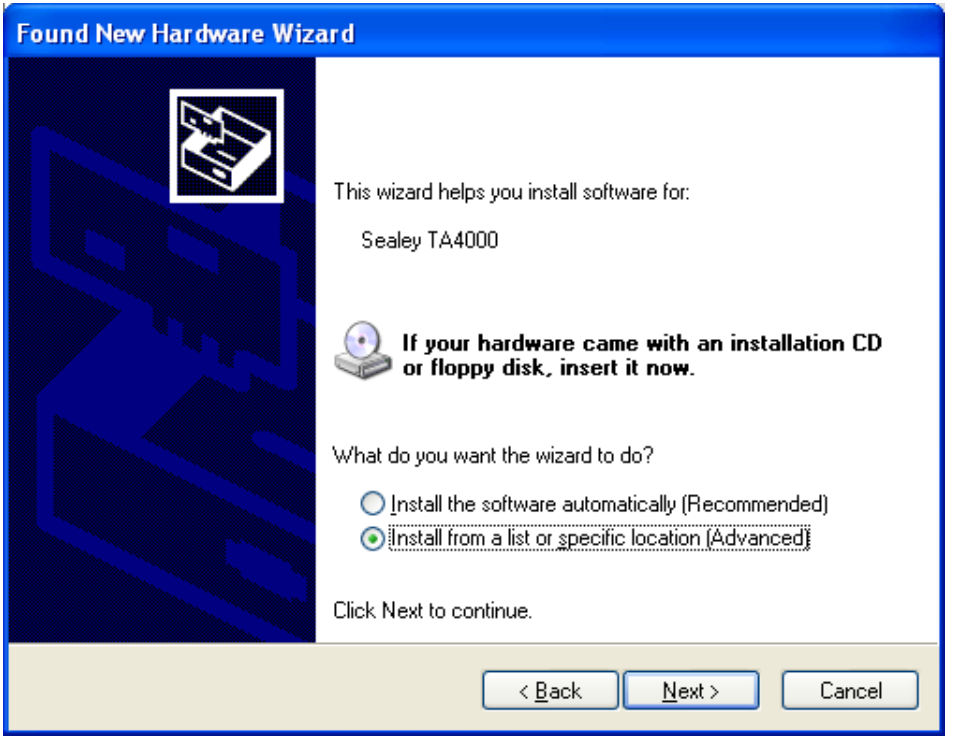
2. Connect the B-Type Plug of the USB cable to the **TA4000** USB port.

3. New hardware is found.

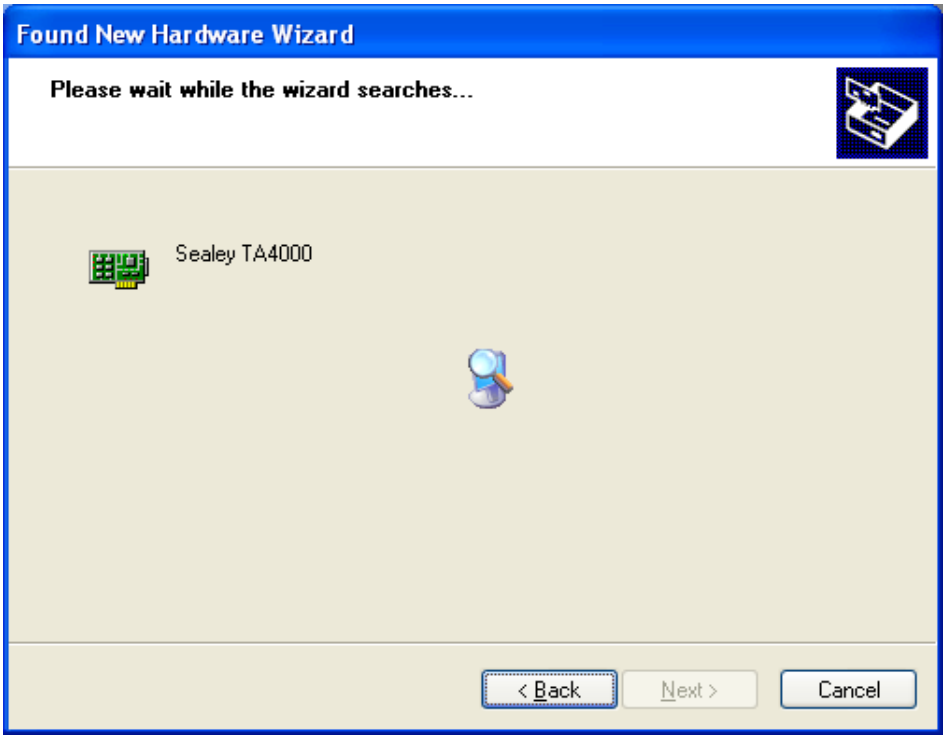
4. New hardware search wizard starts.



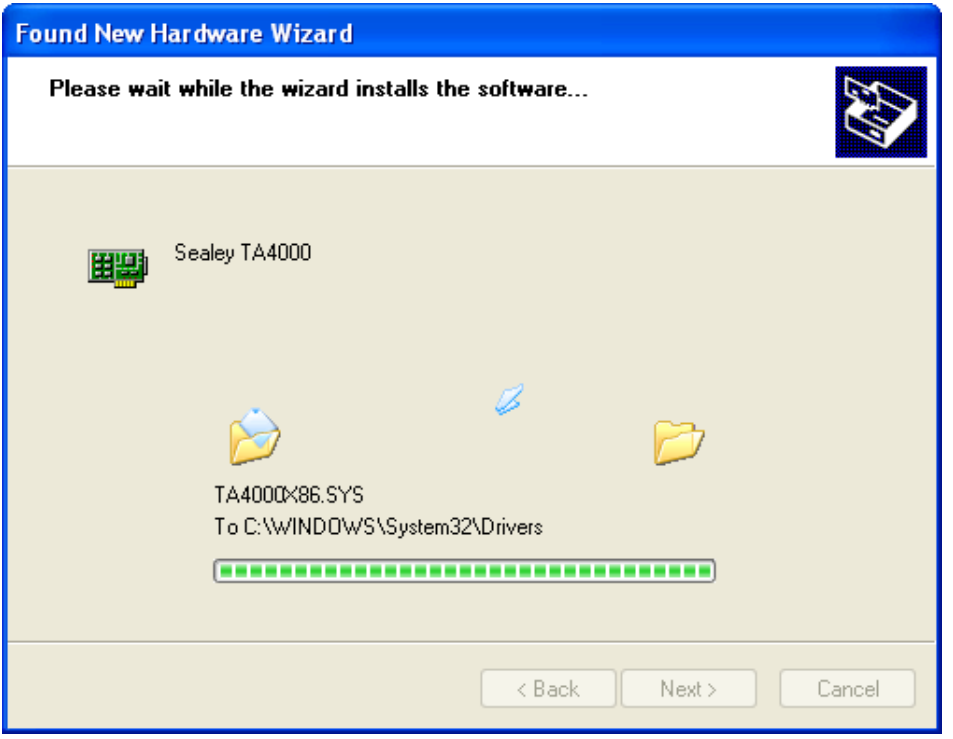
5. Select the specific location.



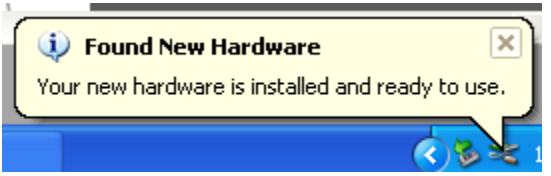
6. New hardware search wizard starts to search for the driver.



7. New hardware wizard installs "**TA4000** DRIVER" .



8. The wizard has finished installing for "**TA4000** USB DRIVER".



General Features

Product features:

- **Four Channel, Bandwidth:** 60MHz
- **Maximum real-time sample rate:** 200MSa/s
- **Memory depth:** 10K-16M points
- **Automatic setup for ease of use (AUTOSET);**
- **Pass/Fail;**
- **Built-in Fast Fourier Transform function(FFT);**
- **20 Automatic measurements;**
- **Automatic cursor tracking measurements;**
- **Waveform storage, record and replay dynamic waveforms;**
- **User selectable fast offset calibration;**
- **Add, Subtract and Multiply Mathematic Functions;**
- **Selectable 20 MHz bandwidth limit;**
- **External trigger;**
- **Waveform average;**
- **Adjustable waveform intensity, more effective waveform view;**

General Check

Please perform the following checks after receiving the **TA4000** oscilloscope:

Check the shipping container for damage:
Keep shipping container and cushioning material if damaged, until the contents of the shipment have been checked and the instrument has been checked mechanically and electronically.

Check the accessories:
Accessories supplied with the **TA4000** are listed in "Accessories" on page 22. If the contents are incomplete or damaged, please notify your dealer.

Check the instrument:
In case there is any mechanical damage or defect, or the instrument does not operate properly, please notify your supplier.

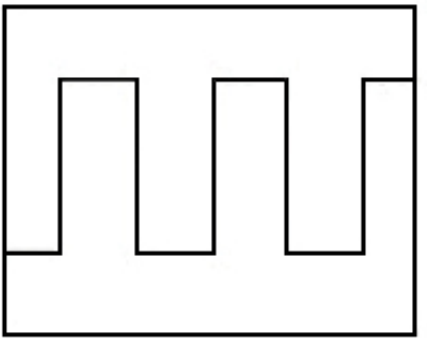
Probe Compensation

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 for the first time.

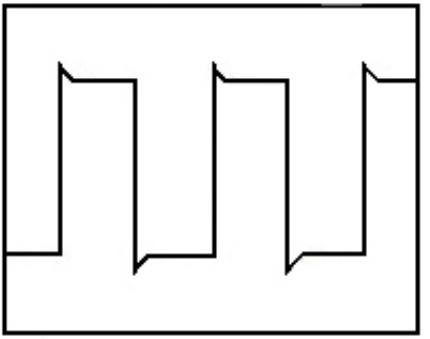
- From the “Probe” menu, select attenuation to 1:10. Set the switch to “x10” on the probe and connect it to CH1 of the oscilloscope. When using the probe hook-tip, insert the tip onto the probe firmly to ensure a proper connection.

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

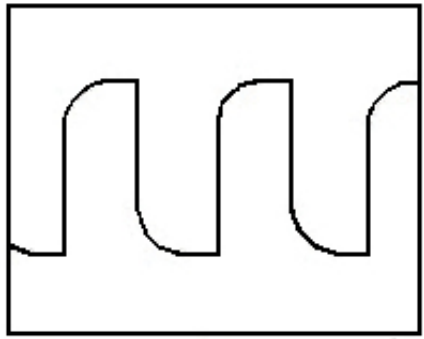
- Check the shape of the displayed waveform.



Correctly Compensated



Over compensated



Under Compensated

■ If necessary, use a non-metallic tool to adjust the trimmer capacitor of the probe for a flat square wave to be displayed on the oscilloscope.

■ Repeat if necessary.

WARNING: To avoid electric shock while using the probe, ensure that the insulated cable is in good condition, and do not touch the metallic parts of the probe head while it is connected to a voltage source.

Function Check

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

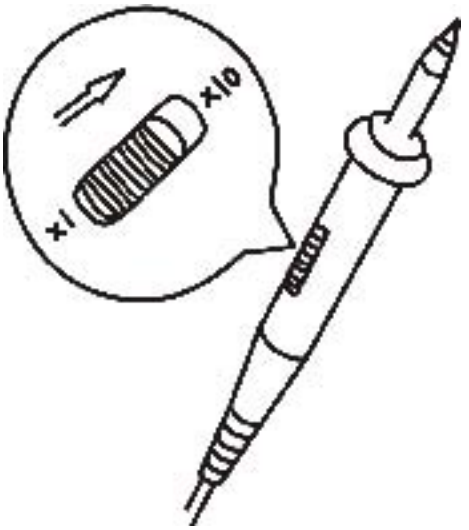
■ **Connect the oscilloscope**
You should connect the Type-A Plug of the USB cable to your PC USB port and connect the Type-B Plug of the USB cable to the oscilloscope USB port.

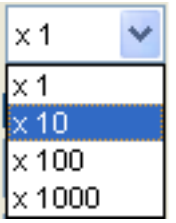
■ **Input a signal to a channel of the oscilloscope**
The oscilloscope is equipped with four channels plus external trigger.

Input a signal using the following steps:

1. Set the attenuation switch on the probe to 10x, and connect the probe lead to the CH1 BNC connector on the oscilloscope. Align the slots in the probe lead connector with the pins on the BNC connector and push home. Rotate the outer ring clockwise to lock it. Attach the tip of the probe and the ground clip to the Probe compensator Connector.

2. Set the CH1 probe attenuation of the oscilloscope to x10. (The default is x1).





3. Attach the tip of the probe and ground clip to the Probe Compensator Connector. Click the button. A square wave will be displayed within several seconds. (Approximately 1 kHz, 2V, peak- to- peak).

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

5. The TA4000.04 oscilloscope probe is used when very accurate measurememts are required. This is the only probe that can be calibrated. For normal automotive testing, calibration wil not be necessary when using the alternative leads and probes supplied.

Self Calibration

The self calibration routine lets you optimise 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, turn on the oscilloscope and wait twenty minutes to ensure it has 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 will take several minutes.

Accessories

Software CD, Start-up Manual, plus items shown below.

fig.1

fig.2

fig.3

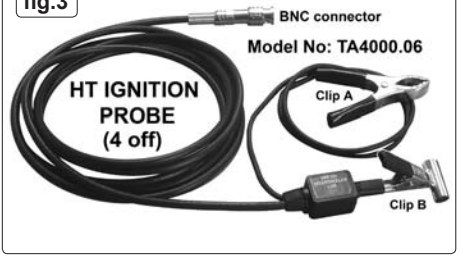


fig.4

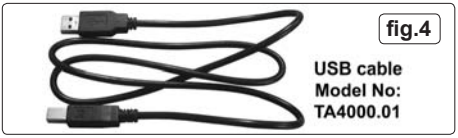
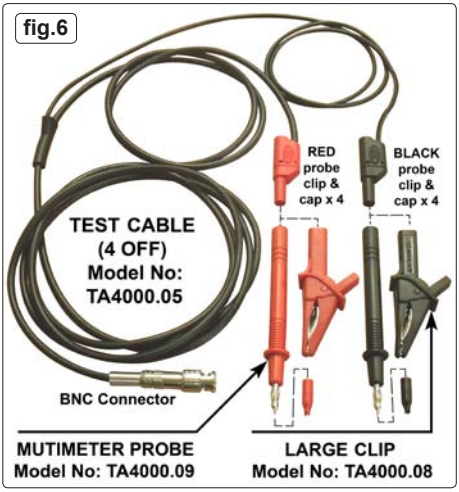


fig.5

fig.6



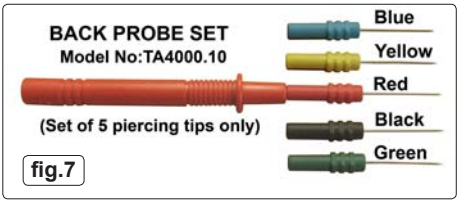


fig.7

fig.8

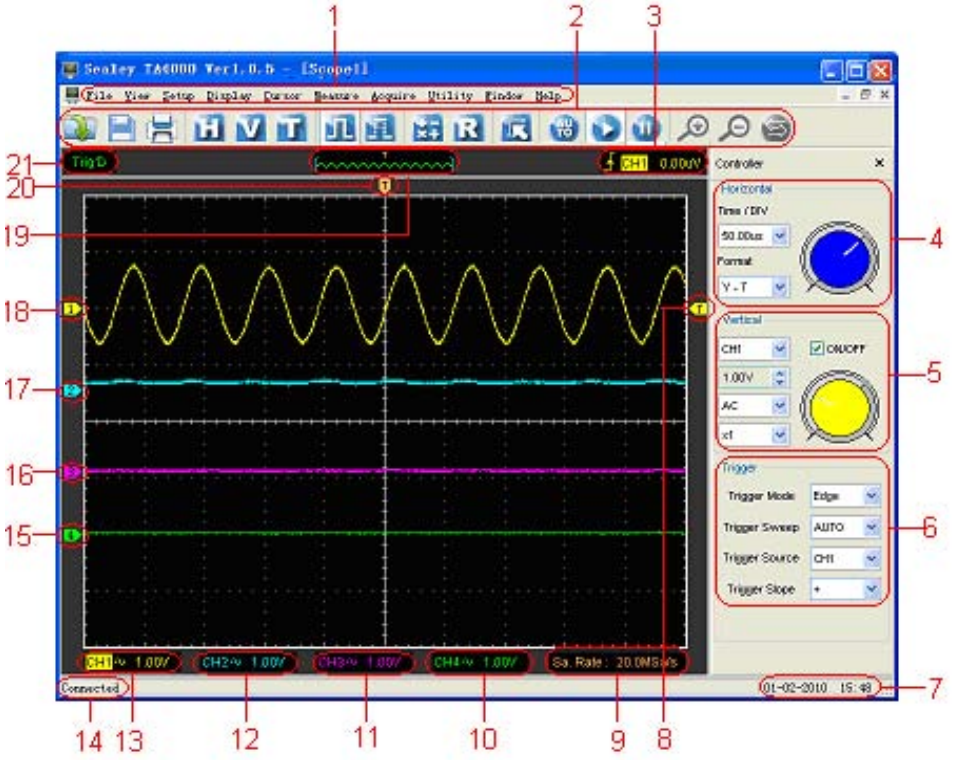
fig.9

Chapter 2 Operating Instructions

- **The User's Interface**
- **The Menu System**
- **The Vertical System**
- **The Horizontal System**
- **The Trigger System**
- **Input Connectors**

The User Interface

After you have finished setting up the software and connecting the equipment, click the software icon on the desk top. The user interface will appear as shown below.



In addition to displaying waveforms, the display area shows additional information 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. **Trigger information**
   The edge trigger slope, source and level are indicated.

4. **The Horizontal Panel**
   The user can change Time/Div, format in this panel.

5. **The Vertical Panel**
   The user can turn CH1/CH2/CH3/CH4 **On** or **Off**. 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. **Indicates system time.**

8. **Marker shows Edge trigger level.**

9. **Indicates the main time base setting.**

10. **Channel 4 (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. **Channel 3 (CH3) 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.

12. **Channel 2 (CH2) 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.

13. **Channel 1 (CH1) 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.

14. **Software status.**

15. **The markers show the reference points of the displayed waveforms. If there is no marker, the channel is not displayed.**

16. **The same as 15.**

17. **The same as 15.**

18. **The same as 15.**

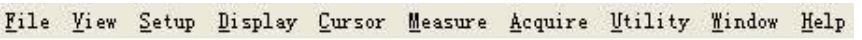
19. **Window indicates the display waveform in buffer position.**

20. **Marker shows horizontal trigger position.**

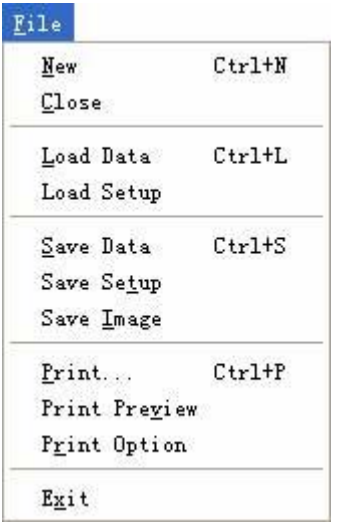
21. **Trigger status indicates the following:**
    AUTO: The oscilloscope is in auto mode and is acquiring waveforms in the absence of triggers.
    Trig'D: The oscilloscope has seen a trigger and is acquiring the post trigger data.
    WAIT: All pretrigger data has been acquired and the oscilloscope 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 recorded waveforms.

The Menu System

The Main Menu

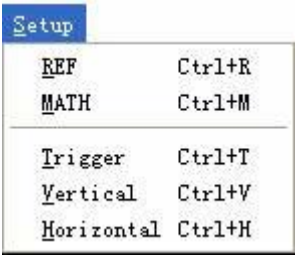


1. **File**: Load or Save data, setup



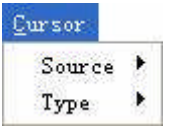
2. **View**: Change the user interface

3. **Setup**: Setup setting

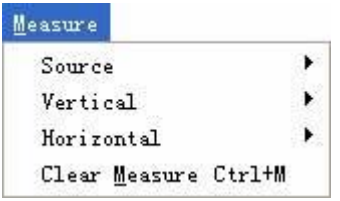


4. **Display**: Change wave display type

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



6. **Measure**: Set measurement parameters



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

8. **Utility**: Utility setting

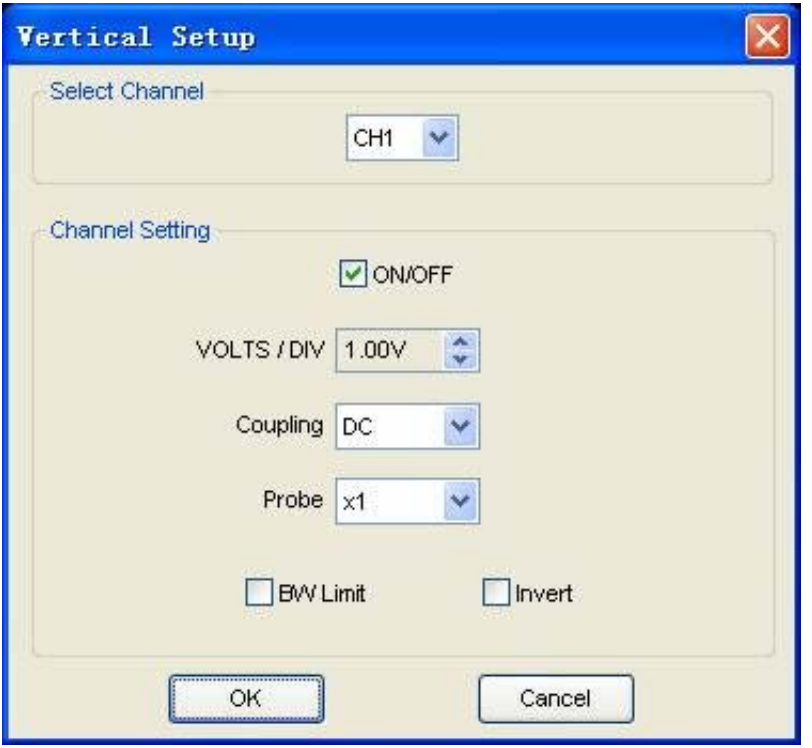
9. **Window**: Window setting

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

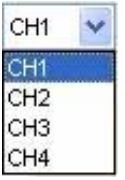
The Vertical System

Click “Setup”->” Vertical”

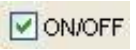
The following figure shows the vertical Setup window. It shows the vertical parameter settings.



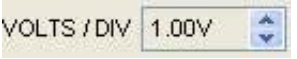
1. Select channel : User can select the channel by clicking the Combo box.



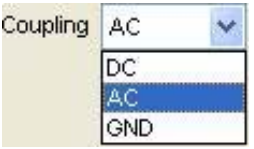
2. ON/OFF: Turn on or off the selected channel.



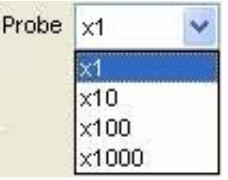
3. VOLTS/DIV: Set the selected channel voltage range.



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



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



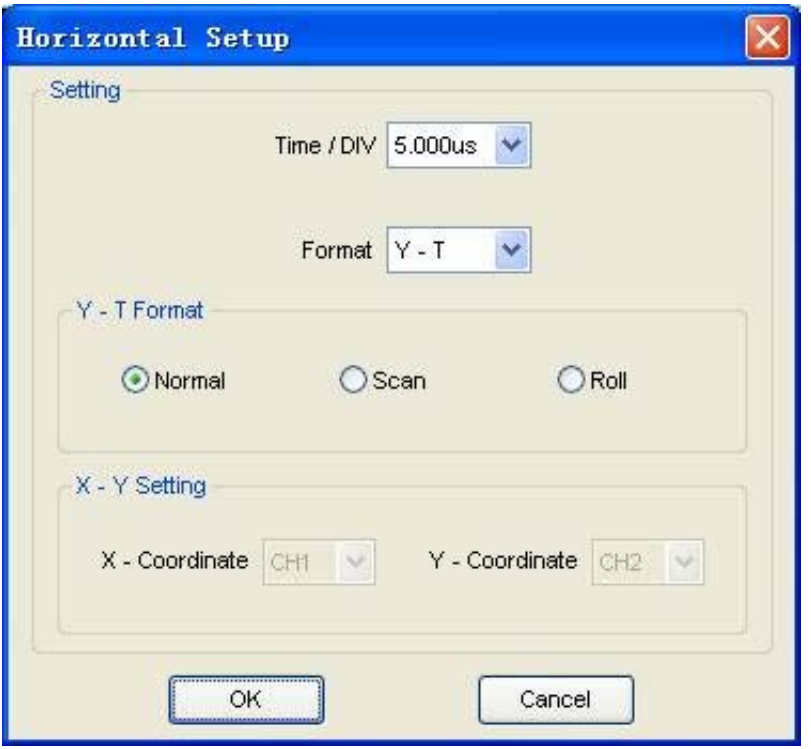
6. BW Limit: Reject the frequency component higher than 20MHz.

7. Invert: Invert the selected wave.

The Horizontal System

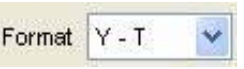
Click ”Setup”->“Horizontal”

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



1. **Time/DIV**: Allows the setting of the time base parameters

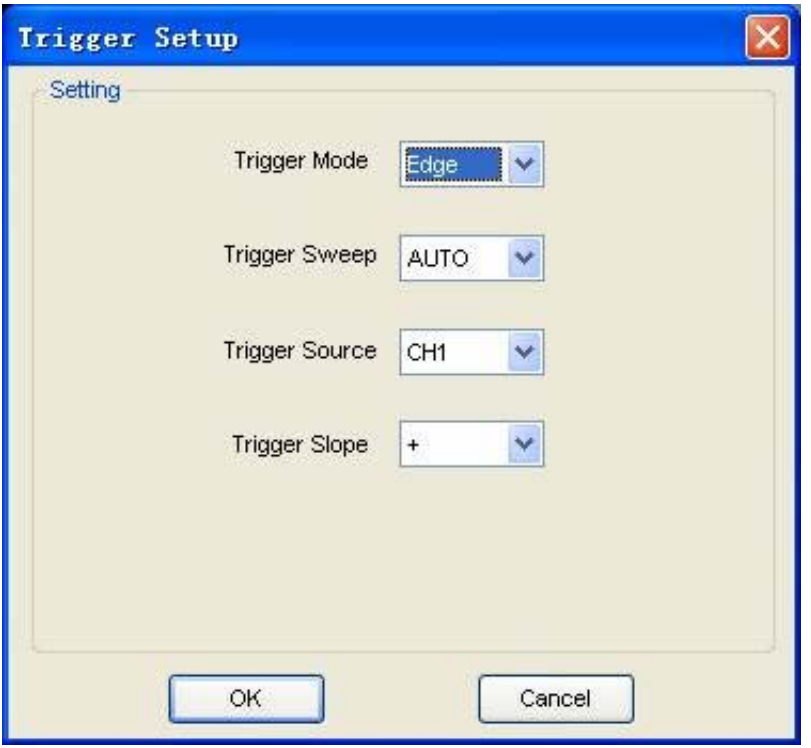
2. **Format**: Allows the setting of the horizontal format parameters



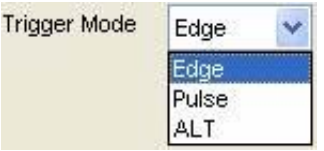
The Trigger System

Click “**Setup**”-> “**Trigger**”

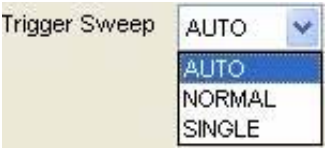
The following figure shows the trigger system control.



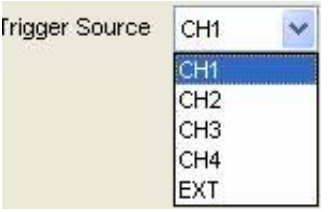
1. **Trigger Mode**: Sets the trigger mode



2. **Trigger Sweep**: Selects the trigger sweep mode to AUTO, NORMAL or SINGLE



3. **Tirgger Source**: Selects the trigger source to CH1, CH2, ALT, EXT or EXT/10



4. **Trigger Slope**: Selects the edge trigger slope to Positive or Negative slope

Input Connector

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

EXT.: Input connector for an external trigger source. Use the Trigger Menu to select the Ext. or Ext./10 trigger source.

Other Connector:

GND.: a ground terminal
USB PORT: Connect the B-Type Plug of USB cable to this port.
CAL.: Probe compensation output.

Chapter 3 Understanding Oscilloscope Functions

- **Set Oscilloscope**
- **Set Vertical System**
- **Set Horizontal System**
- **Set Trigger System**
- **Save/Load**
- **Utility Function**
- **Measure Signal**
- **Zoom In/Out Waveforms**
- **Acquire Signal**
- **Print**

Setup the Oscilloscope

Using "AUTOSET" to display a signal automatically
Push the "**AUTOSET**" button to obtain a stable waveform display. It automatically adjusts the vertical scale, horizontal scale and trigger settings. Auto setup also displays several automatic measurements in the main display area, depending on the signal type.

Connect a signal to the CH1 input:

1. Connect an input signal to the oscilloscope as described on page 35.

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 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 permanently 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, select the "**Factory Setup**" menu.

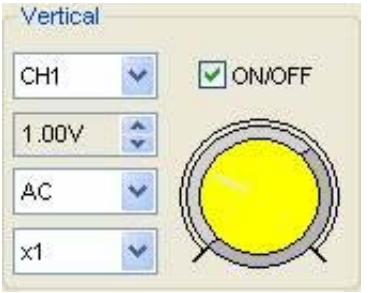
Set Vertical System

Set Channel

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

Select a channel.

See the Channel Control Panel in sidebar.



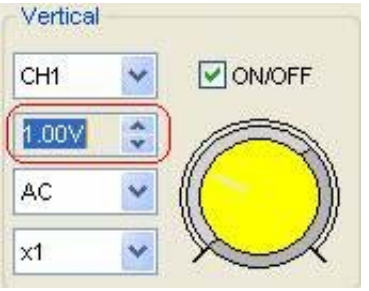
The Vertical function:

ON/Off: Turns the channel on or off.
Volt/DIV: Select the channel voltage/div
Coupling: Select the channel coupling
Probe: Select the channel probe attenuation
Filter: Select software filter
Reset: Set the channel vertical position to zero
Invert: Turn on/off the invert function.
BandWidth Limit: Limit the channel bandwidth to 20MHz to reduce noise.

Change Volt/DIV

You can select “Volt/Div” in “Vertical Setup” window to select the voltage

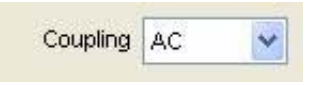
You can also change the selected channel voltage in sidebar



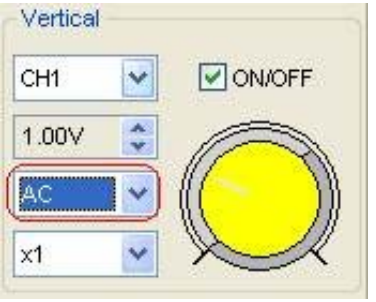
Left click and drag the mouse on the knob to change the voltage.

Set Channel Coupling

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



In the sidebar, you can also change the channel coupling.



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

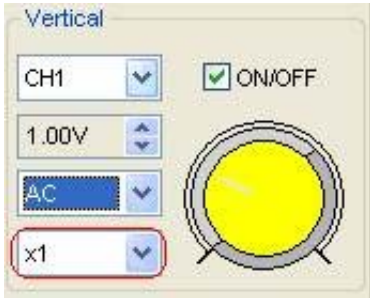
Probe Attenuation Setting

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

This setting remains in effect until it is changed again.

Click “**Probe**” in Vertical Setup window to select the probe attenuation

The probe setting window in the sidebar

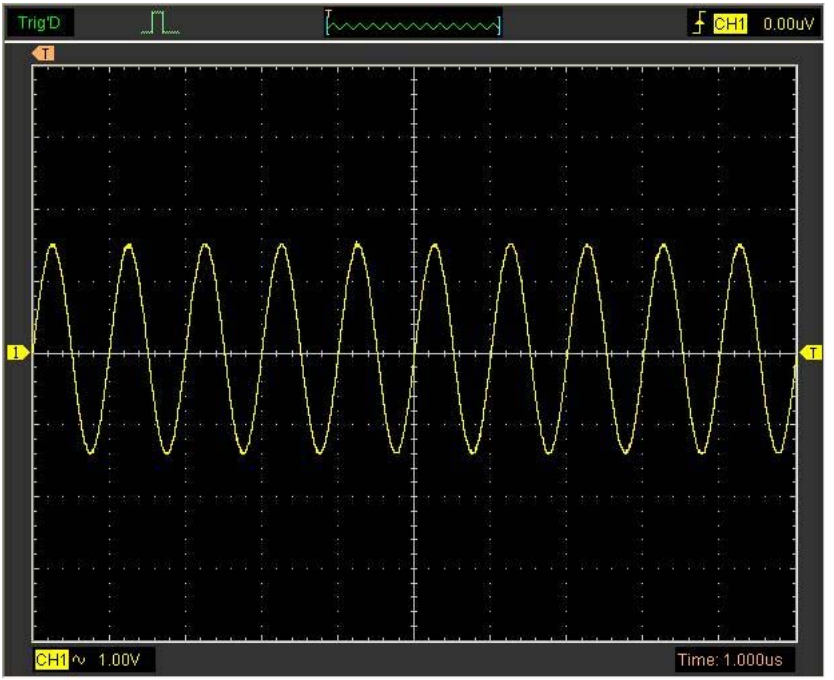


Note: The attenuation factor changes the vertical scale of the oscilloscope so that the measurement results reflect the actual voltage levels at the probe tip.

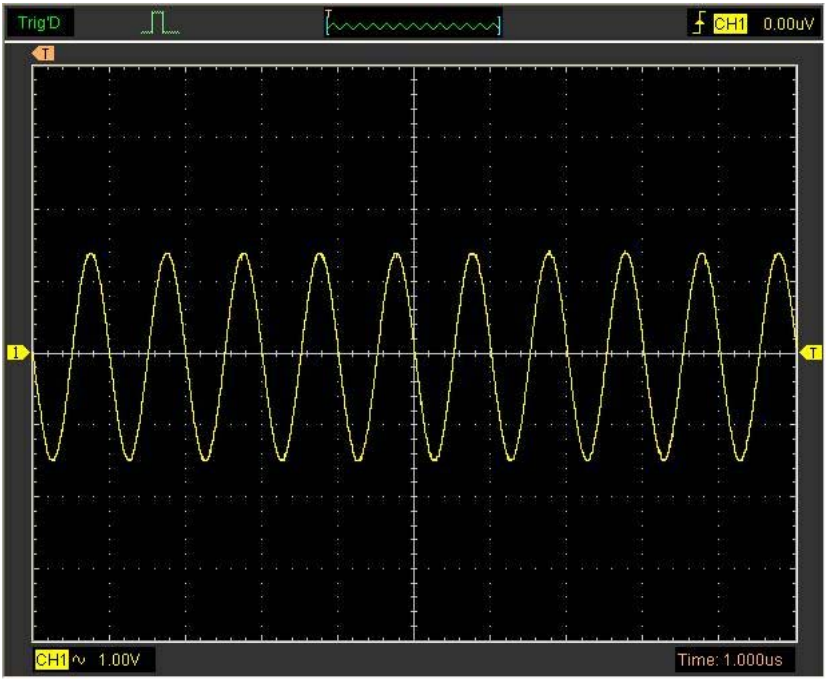
Invert

The invert function turns the displayed waveform through 180 degrees. When the oscilloscope is triggered on the inverted signal, the trigger is also inverted.

Click “**Invert**” in Vertical window

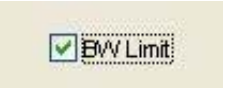


The picture above shows the waveform inverted:



Set the Channel Bandwidth Limit

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

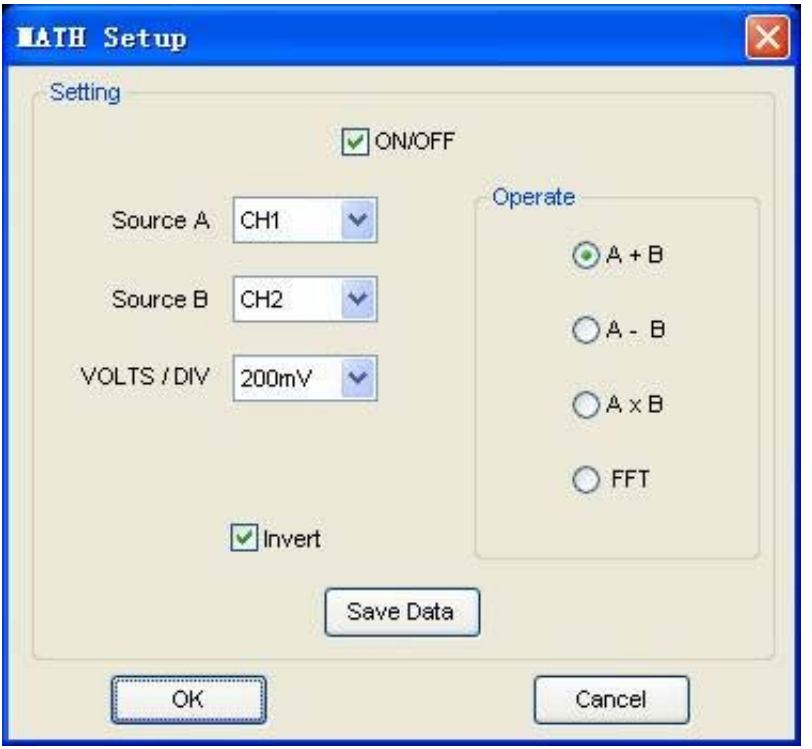


When the "**BW Limit**" is turned on, a "B" sign will be displayed at the bottom of display screen.

Set Math

Click "**MATH**" in **Channel** menu to set **MATH** channel.

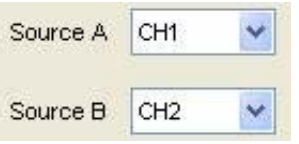
The **MATH Setup** window



ON/OFF: Turns the MATH Channel On or Off.
Source A/B: Set the sources of the math channel.
Operate: Sets the mode of operation for the math channel.
Volt/DIV: Set the resolution of the math channel.
Probe: Set the math channel probe attenuation.
Invert: Turn on/off the invert function
The mathematic functions include addition, subtract, multiply and FFT for CH1, H2,CH3 and CH4.

Source A/B

Source A and Source B Menu



Operate Function

There are four modes of operation:

A + B Add source A and source B

A - B Subtract source B from source A

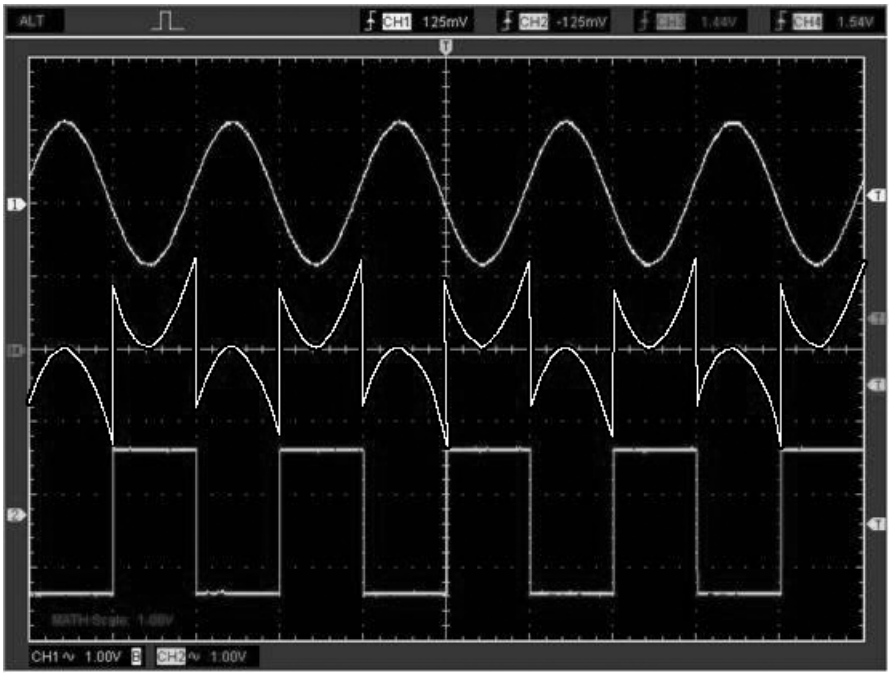
A × B Multiply source A by source B

FFT Convert a time-domain signal into its frequency components (spectrum).

In this function, use the addition, subtraction, multiplication and FFT function to operate and analyse the waveform.

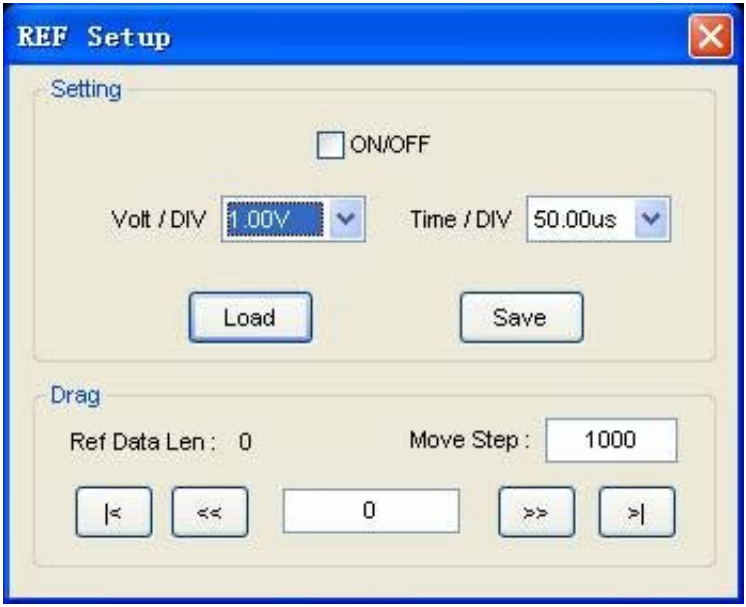
Select the operation type in the **Operate** menu. Select source A and B. Then adjust the vertical scale and offset to view the maths channel clearly. The mathematic result can be measured by the measure and the cursor.

The Math Function Display



Set Reference

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



The Reference Channel Function:

On/Off: Turns the reference channel on or off .
Volt/DIV: Adjust the resolution of the reference channel.
Load: Load the reference waveform from an “.rfc” file on your computer.
Save: Save the current reference waveform to your computer as “.rfc” format.
Save Reference: Save the current reference waveform to your computer as “.rfc” format.
You can change the vertical scale of a waveform. The waveform display will contract or expand relative to the reference level.

Load

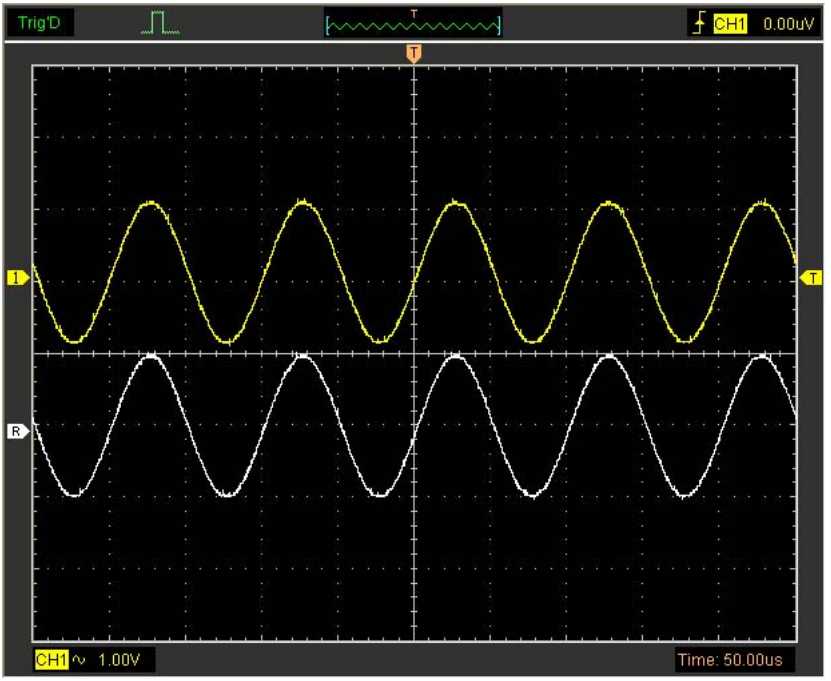
Click “**Load**” to load the *.rfc file that was selected. The load file window will appear.

Save

Click “**Save** ” to save the waveform to *.rfc file. The saved source window appears.

The save file window will appear allowing you to select the source you wish to save.

The Reference Waveform Display Window:



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

Setup Horizontal System

Change Time/Div

Selects the horizontal **Time/DIV** (scale factor) for the main or the window time base

The Horizontal Panel

Click on and rotate the blue knob to change **Time/Div**.

If the waveform acquisition is stopped, **Time/Div** control expands or compresses the waveform.

Change Format

Click "**Time/Div**" to set the Time base in Horizontal Setup window

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

Y – T: Show the relative relation between vertical voltage and horizontal time
Roll: In Roll Mode, the waveform display updates from right to left
X – Y: Show CH1 value at X axis; CH2 value at Y axis

In **Roll** mode, the waveform display rolls from right to left. No trigger or horizontal offset control of waveforms are available during Roll Mode, and are only available when set to 1s/div or slower.

Note: If the time/div is longer than 1s, the format will change to Roll mode automatically.

Change Horizontal Position

Double click the channel button to set the trigger point to the horizontal centre of the screen.

Horizontal position changes the displayed waveform position, relative to the trigger point.

The user can drag on screen to change the horizontal position.

Set Trigger System

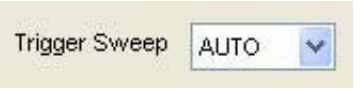
Set Edge Trigger

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 oscilloscope finds the trigger point on the rising or the falling edge of a signal. Select **Edge** trigger mode to trigger on **Rising** edge or **Falling** edge.

Mode: Select the trigger mode.

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

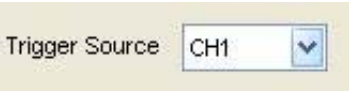


Auto: Acquires a waveform even if no trigger occurs.

Normal: Acquires a waveform when a trigger occurs.

Single: Acquires a waveform when a trigger occurs then stops.

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, or to the EXT. 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

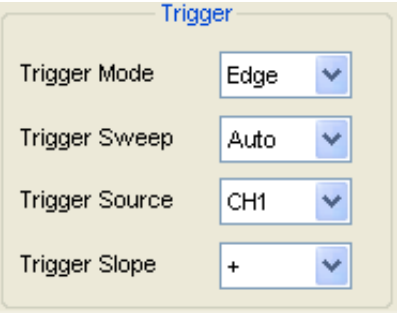
EXT: Select EXT as trigger signal

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

Rising: Trigger on rising edge

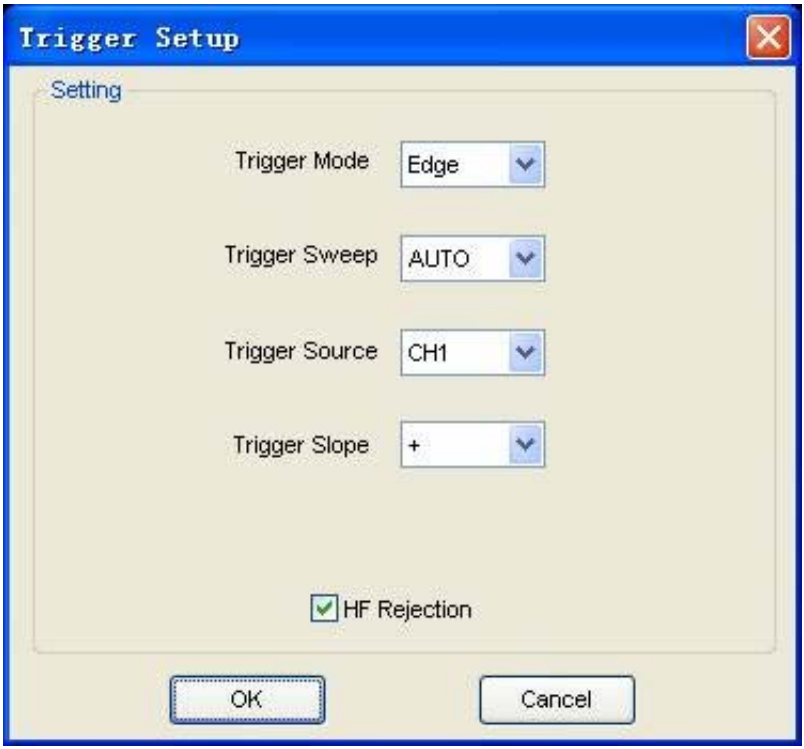
Falling: Trigger on falling edge

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



High Frequency Rejection

Select "**HF Rejection**" in "**Trigger Setup**" window



The user can turn on “HF Rejection” to eliminate triggering higher-frequencies. (20M above).

Set Pulse Trigger

Pulse trigger occurs according to the width of pulse. The abnormal signals can be detected through setting up the pulse width condition.

Mode: Select the trigger mode to **Pulse**.

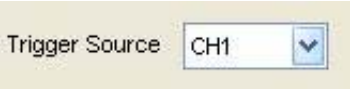
Sweep: Set the sweep mode to **AUTO**, **NORMAL** or **SINGLE**.

AUTO: Acquire waveform even if no trigger occurs.

NORMAL: Acquire a waveform when a trigger occurs.

SINGLE: Acquire a waveform when a trigger occurs then stops.

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, or to the EXT. BNC.



CH1: Select CH1 as trigger signal

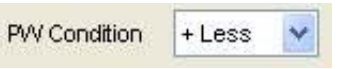
CH2: Select CH2 as trigger signal

CH3: Select CH3 as trigger signal

CH4: Select CH4 as trigger signal

EXT: Select EXT as trigger signal

PW Condition: Set the PW Condition to the following condition.



+More: +Pulse width more than selected pulse condition.

+Less: +Pulse width less than selected pulse condition.

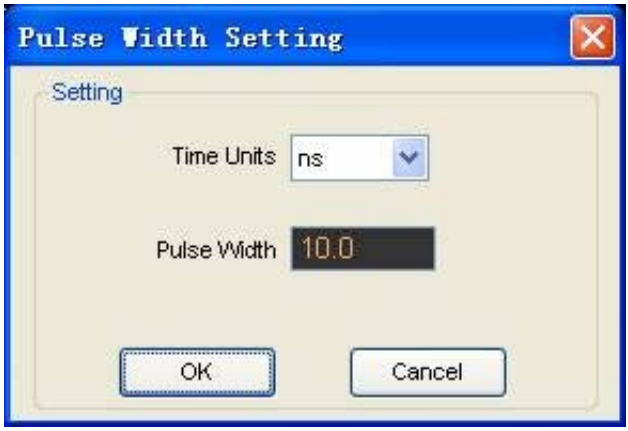
+Equal: +Pulse width equal to selected pulse condition.

-More: -Pulse width more than selected pulse condition.

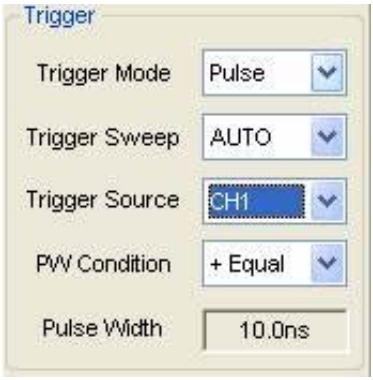
-Less: -Pulse width less than selected pulse condition.

-Equal: -Pulse width equal to selected pulse condition.

Pulse Width: The Pulse Width adjust range is 10ns~10s. When the condition is met ,it will trigger and acquire the waveform.



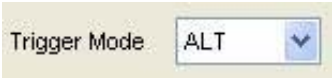
The user can also change the trigger setting on the trigger panel in the sidebar.



When the alternative trigger is on, the trigger sources come from two vertical channels. This mode can be used to observe two non-related signals. You can choose two different trigger modes for the four vertical channels.

Set ALT System

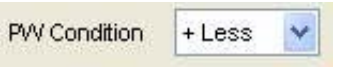
Mode: Select the trigger mode.



Trigger Channel: Set the Trigger Channel to **CH1**,**CH2**,**CH3** or **CH4**.

Trigger Type: Set the Trigger Type to **Edge** or **Pulse**.

PW Condition: Set the PW Condition to the following condition.



+More: +Pulse width more than selected pulse condition.

+Less: +Pulse width less than selected pulse condition.

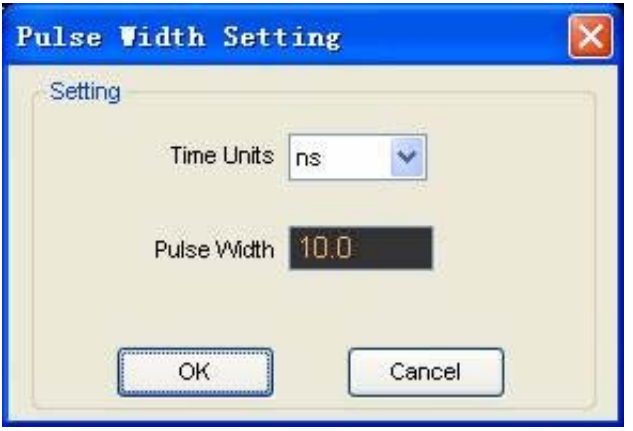
+Equal: +Pulse width equal to selected pulse condition.

-More: -Pulse width more than selected pulse condition.

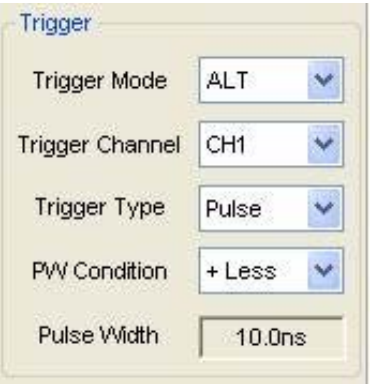
-Less: -Pulse width less than selected pulse condition.

-Equal: -Pulse width equal to selected pulse condition.

Pulse Width: The Pulse Width adjust range is 10ns~10s. When the condition is met, it will trigger and acquire the waveform.



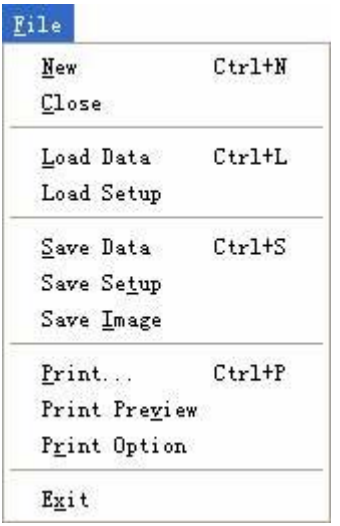
The user can also change the trigger setting on the trigger panel in the sidebar.



Save/Load

Save

Click “**File**” in main menu to save waveform, setups and screen



1. **Save Data**

Save waveform data as a file

2. **Save Setup**

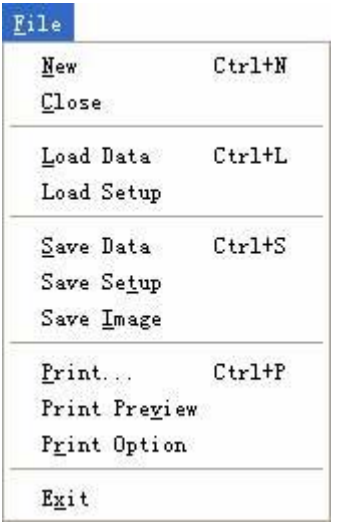
Save the current oscilloscope setup to file

3. **Save Image**

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

Load

Click “**File**” in main menu to recall saved waveform setup



1. **Load Data**

Load the waveform that was saved as a file.

2. **Load Setup**

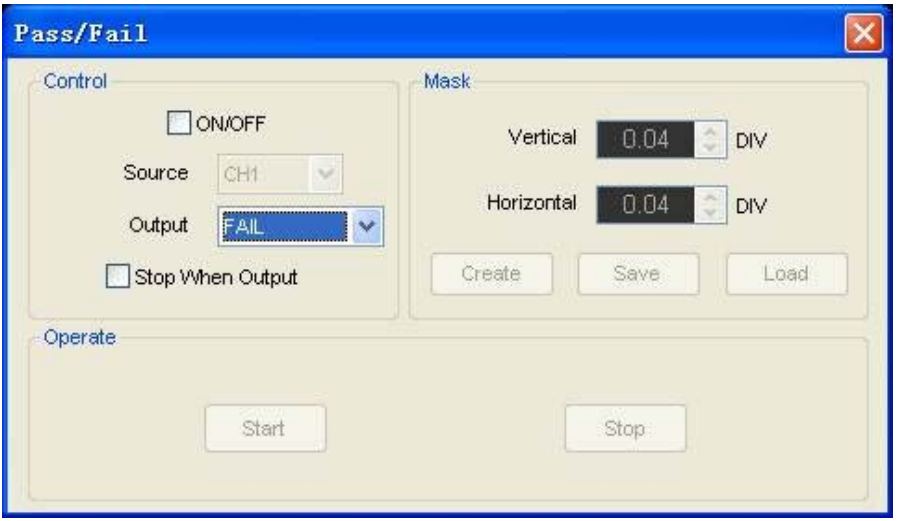
Load the setup that was saved.

Utility/Function

Pass/Fail

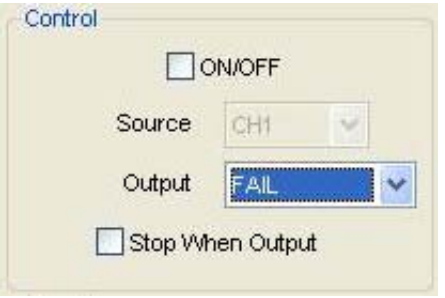
Select “**Pass/Fail**” in “**Utility**” menu

The **Pass/Fail** window appears:

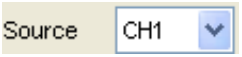


The **Pass/Fail** function monitors changes to the signals or the outputs by comparing the input signal with a pre-created template.

Control Setting



Source:



Select the **Pass/Fail** channel

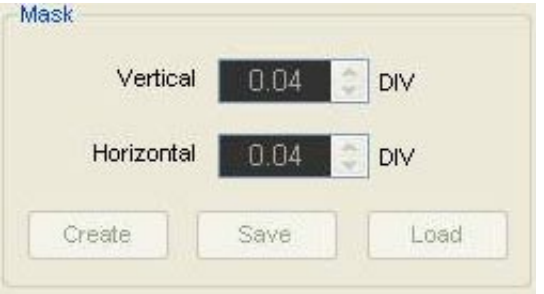
Output:

Select the **Pass/Fail** output condition

Stop When Output:

If selected the Pass/Fail will stop depending on what output was selected.

Mask Setting



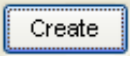
Vertical:

Set the vertical limit range

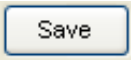
Horizontal:

Set the horizontal limit range

“Create” button:



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

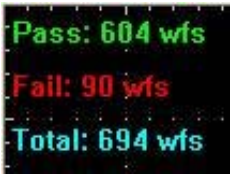
“Save” button: 

Click this button to save the setups to file.

“Load” button:

Click this button to load the saved setups file.

Information Display

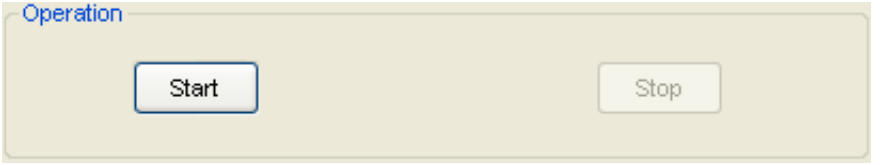


Fail:
It shows the fail waveform number

Pass:
It shows the pass waveform number

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

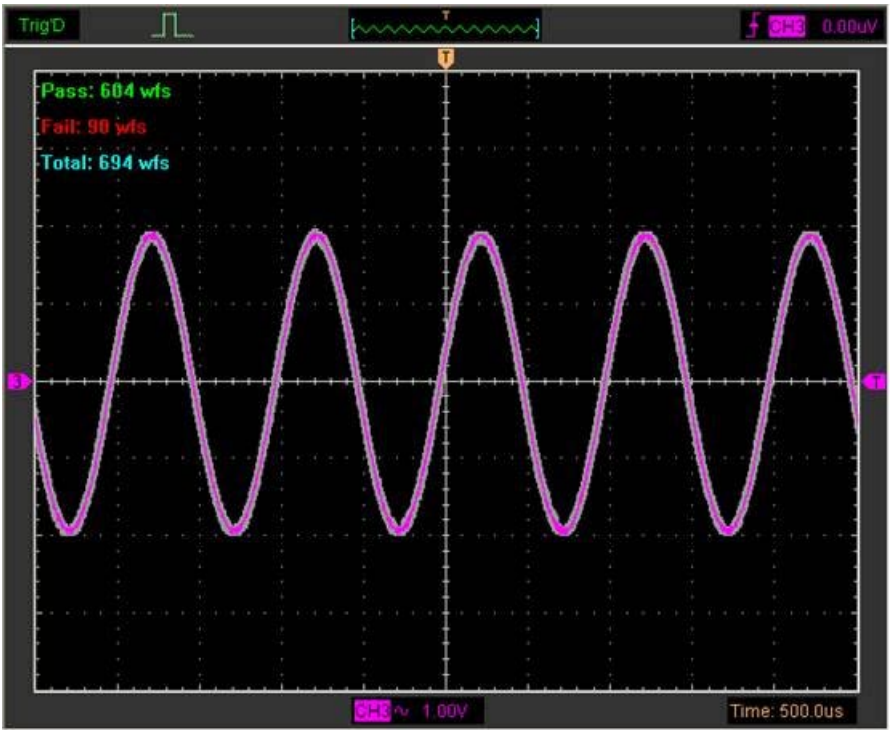
Operation



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 and **Roll** mode.

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 and CH2 waveforms and removes all other waveforms.

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

The Factory Setup function does not reset the following settings:

- Language option
- Date and time

Language

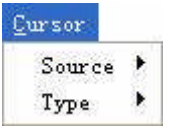
Click "**Language**" in "**Utility**" menu

There are four languages in the "**Language**" menu. The default language is English.

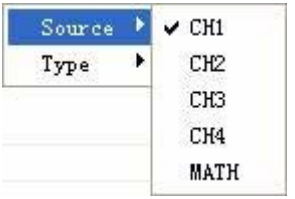
Measure Signal

Cursor Menu

Select“**Cursor**” in main menu

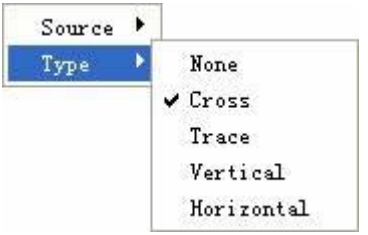


1. **Source**



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

2. **Type**

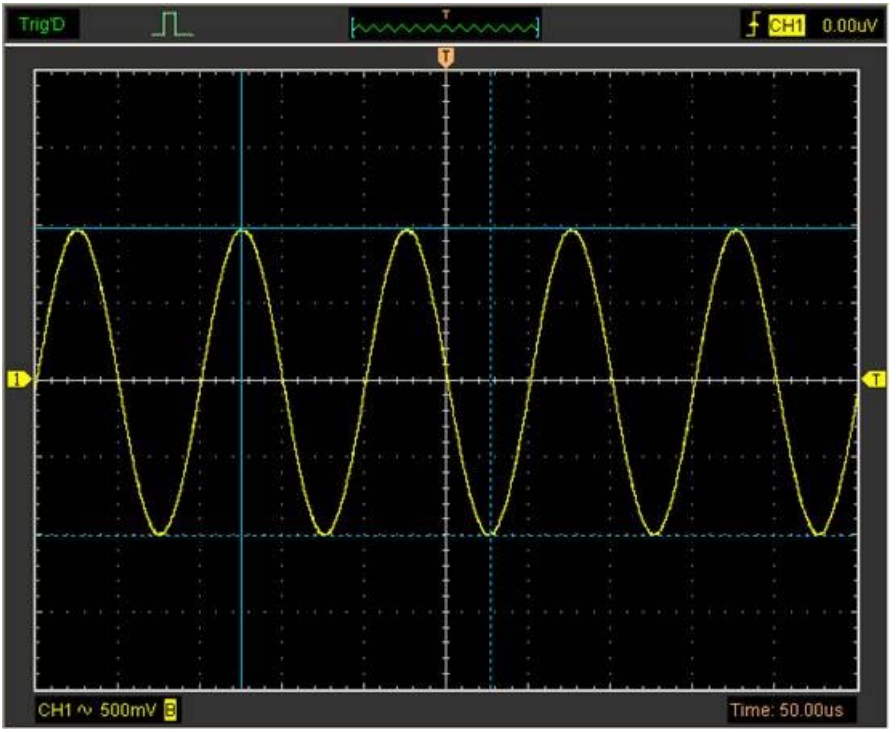


There are four types of cursors: **Cross**, **Trace**, **Vertical** and **Horizontal**

1) **Cross**

The **Cross** cursors appear as cross lines on the display and measure the vertical and horizontal parameters.

Cross cursor display window

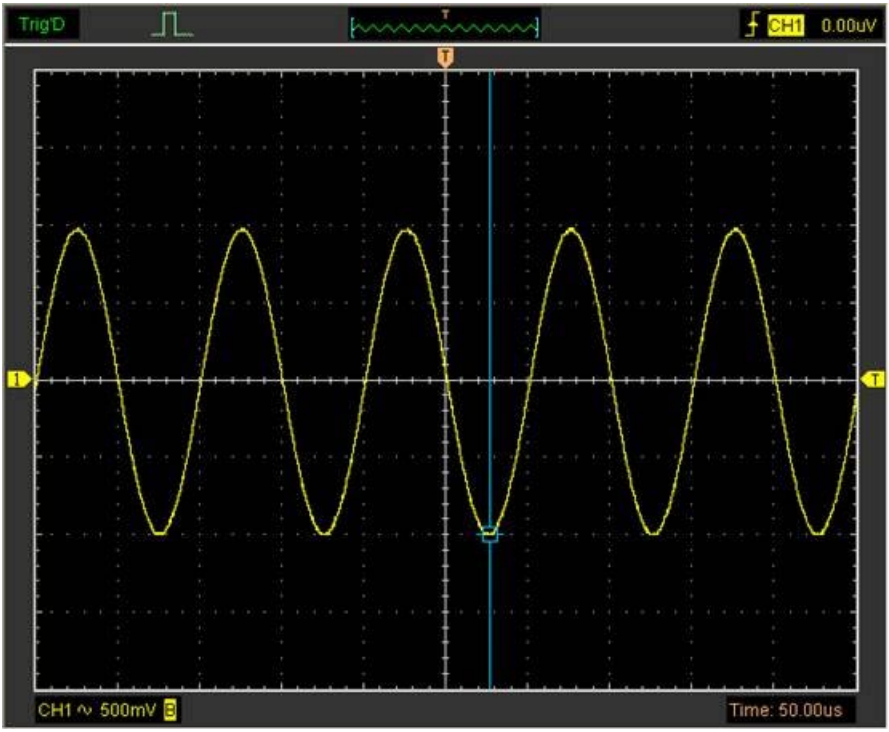


The **Cross** measure result is displayed on the status bar.

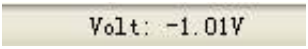
2) **Trace**

The **Trace** cursors appear as vertical lines on the display and measure the waveform amplitude at the point the waveform crosses the cursor.

The **Trace** cursor display window



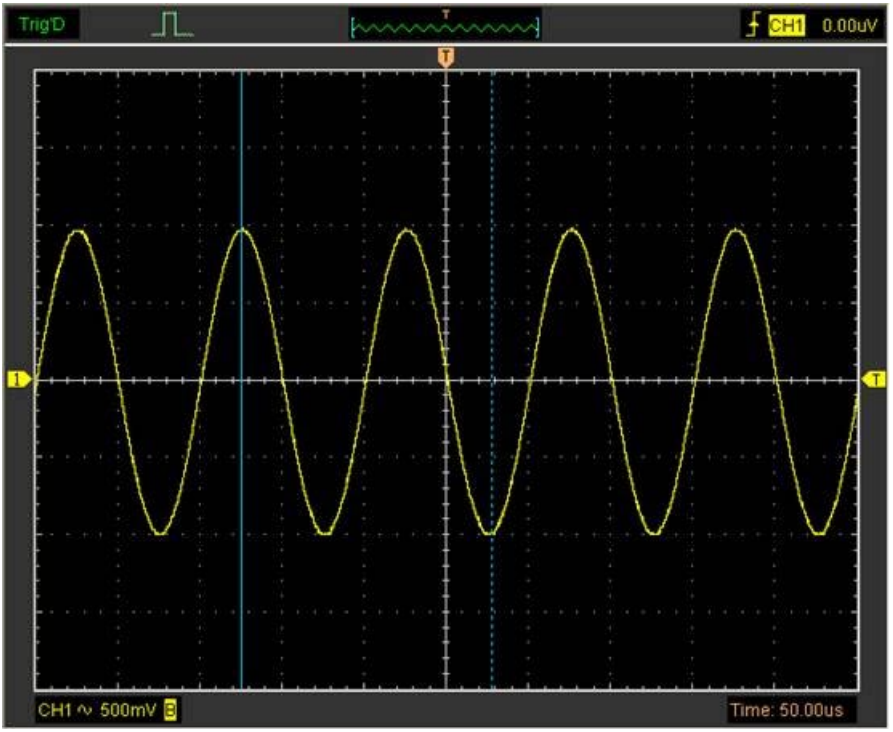
The **Trace** cursor measurement result is displayed on the status bar.



3) **Vertical**

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

Vertical cursor display window



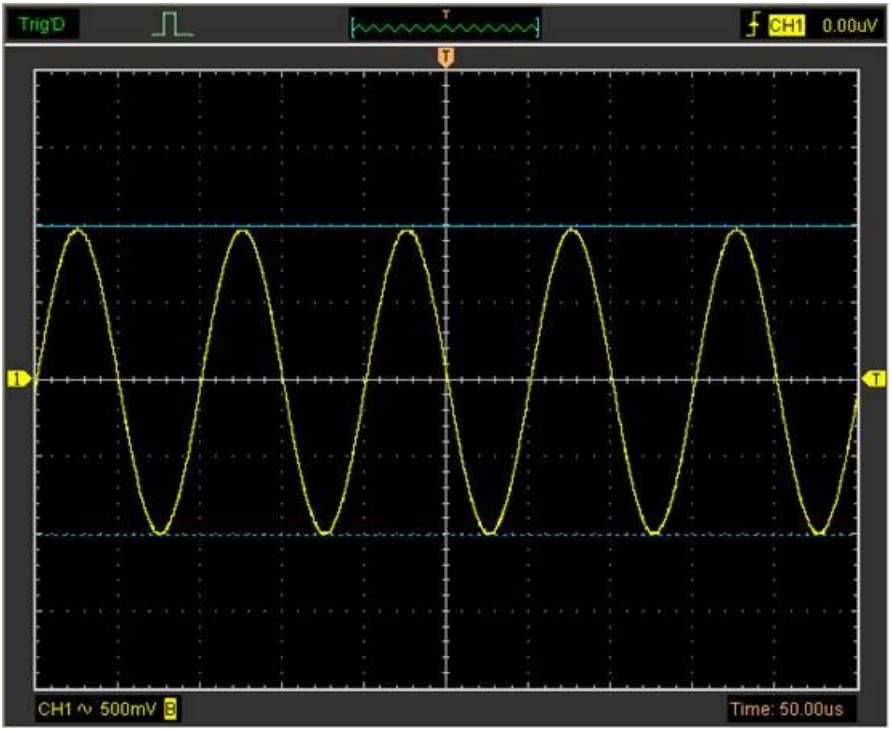
The **Vertical** cursor measurement result is displayed on the status bar.

4) **Horizontal**

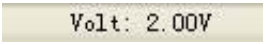
The **Horizontal** cursors appear as horizontal lines on the display and measures the horizontal parameters.

Horizontal cursor display window

Horizontal cursor display window



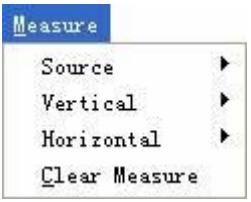
The **Horizontal** cursor measurement result is displayed on status bar.



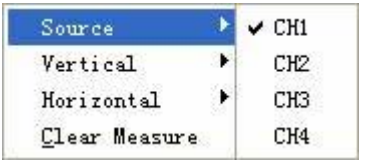
Measure Menu

Select "**Measure**" in main menu.

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

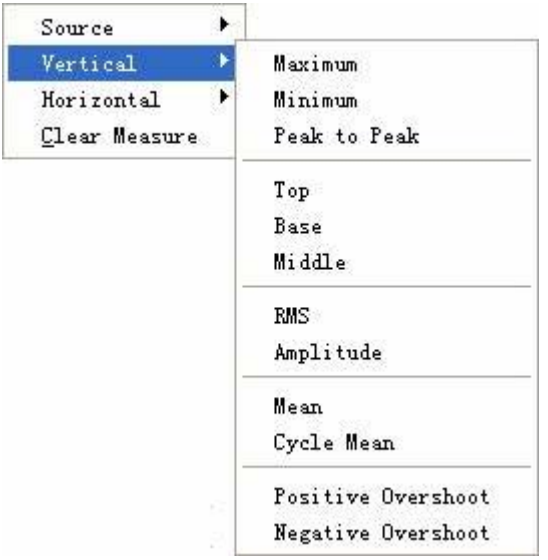


1. **Source**



The “**Source**” menu is used to select a measurement source.

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: Average voltage between maximum and minimum level of the waveform

RMS: The Root Mean Square voltage over the entire waveform

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

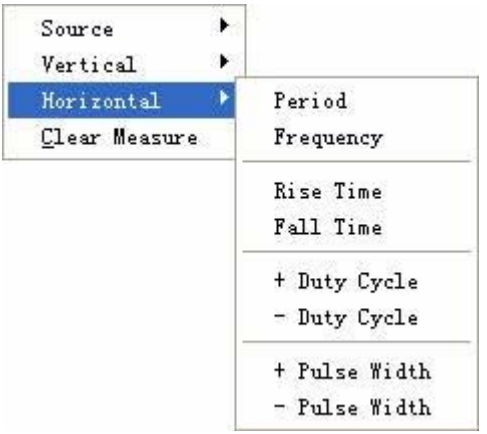
Mean: The arithmetic mean over the entire waveform

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

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

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 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 cycle in waveform

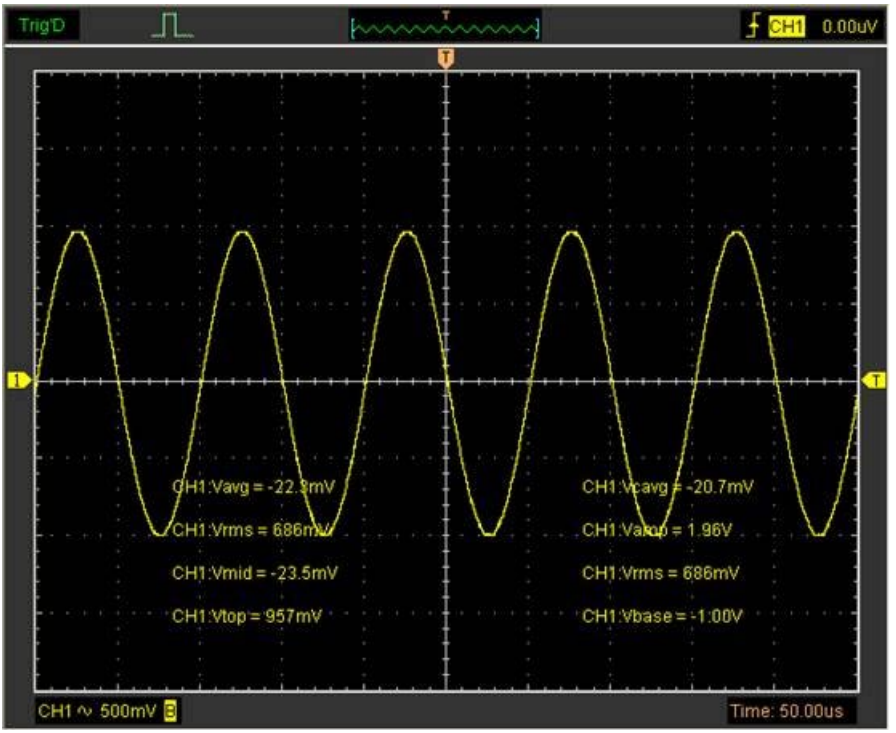
+Pulse Width: Measurement of the first positive pulse in the waveform. The time between the 50% amplitude points

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

4. **Clear Measure**

Clear all measured items on display screen.

The **Measure** Display Window



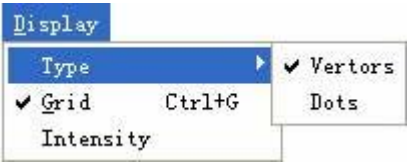
Note: The results of the automatic measurements will be displayed on the bottom of the screen. A maximum of 8 results can be displayed at the same time. When there is no room, the next new measurement result will make the previous results move left, off of the screen.

The Display System

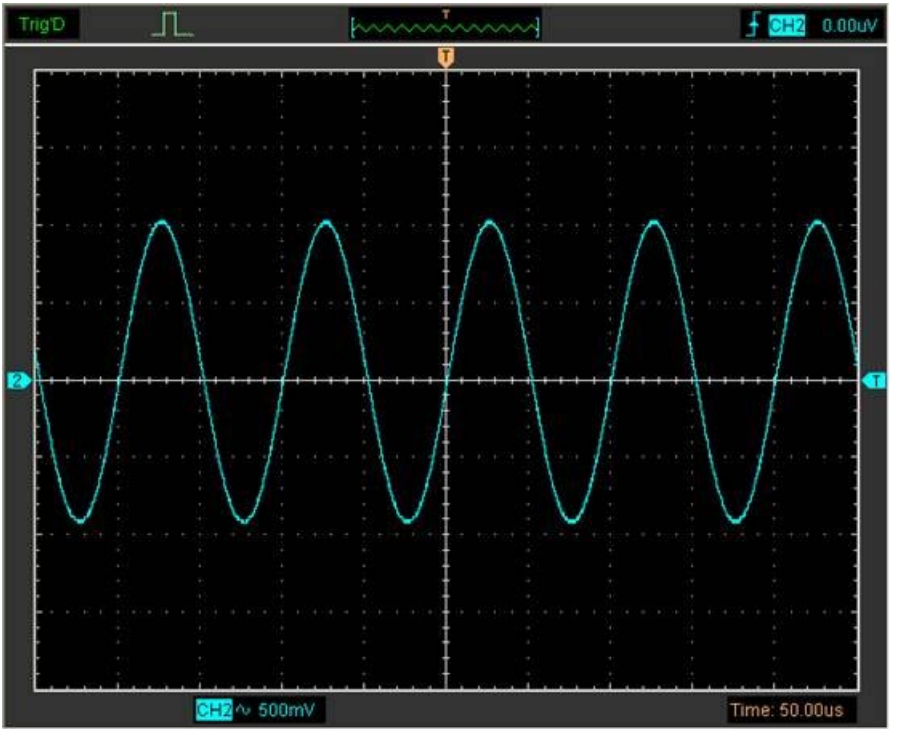
Display Type

Select “**Type**” in “**Display**” menu.

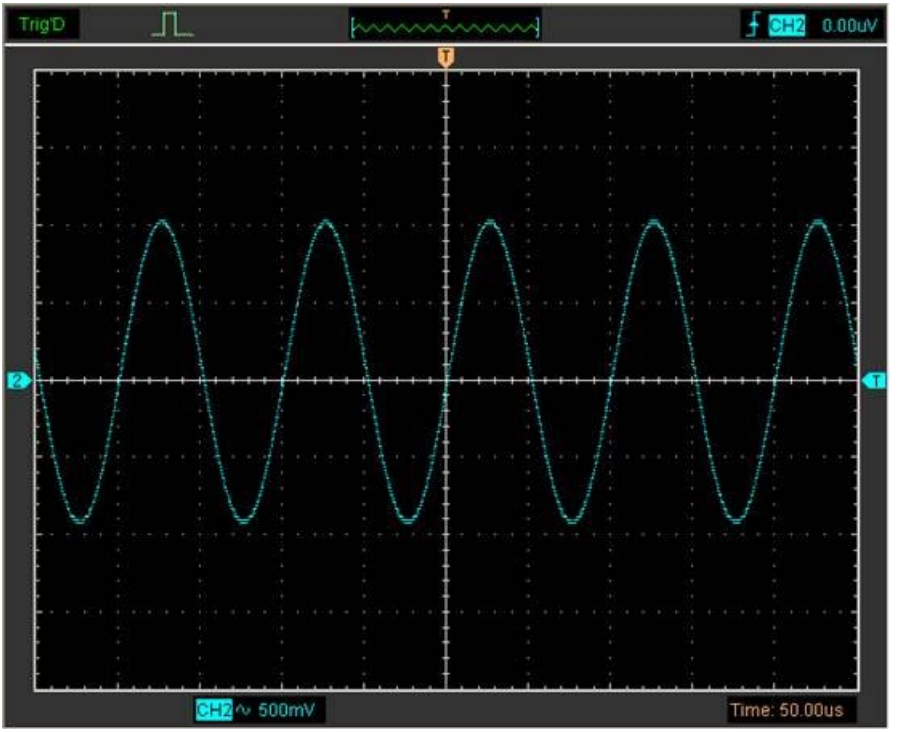
The following figure shows the different parameters settings.



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



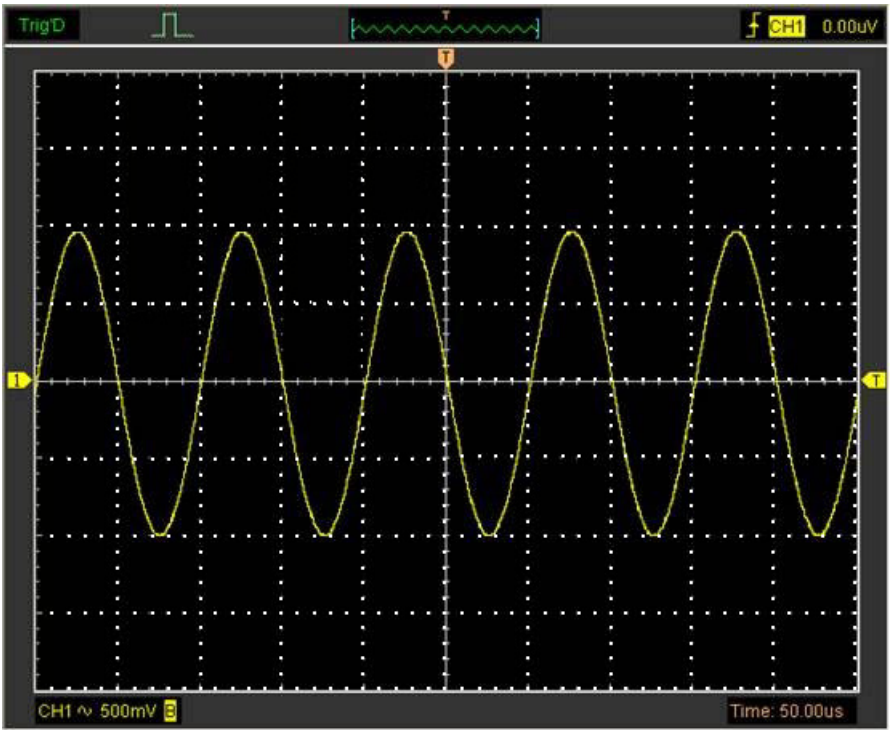
If the Dots type mode is selected, the waveform will be displayed as follows.



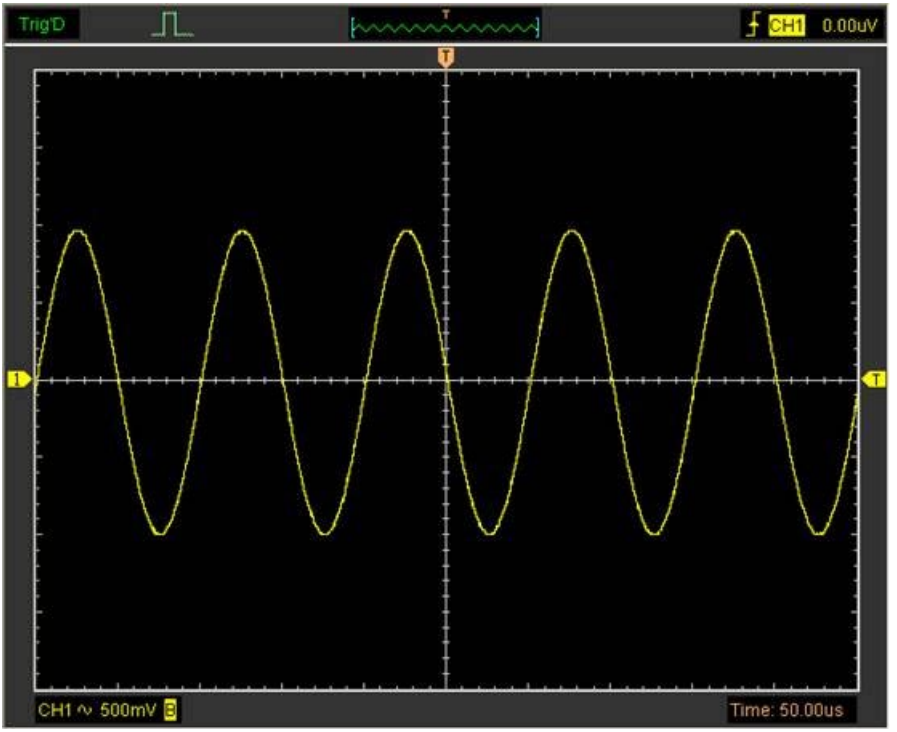
Display Grid

Select "**Display**" in main menu.

Grid shown:



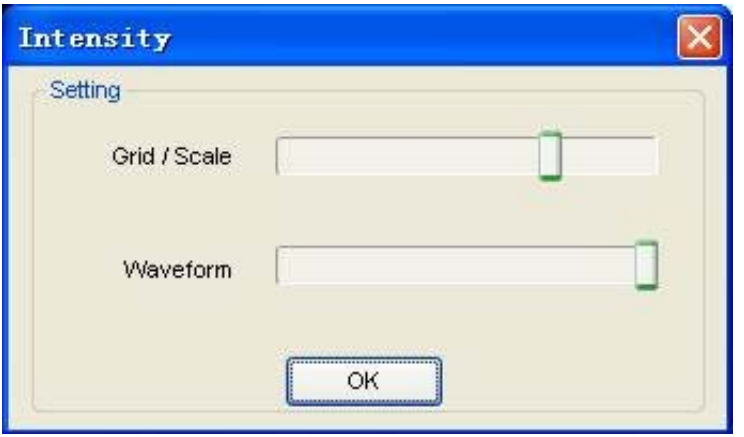
Grid not shown:



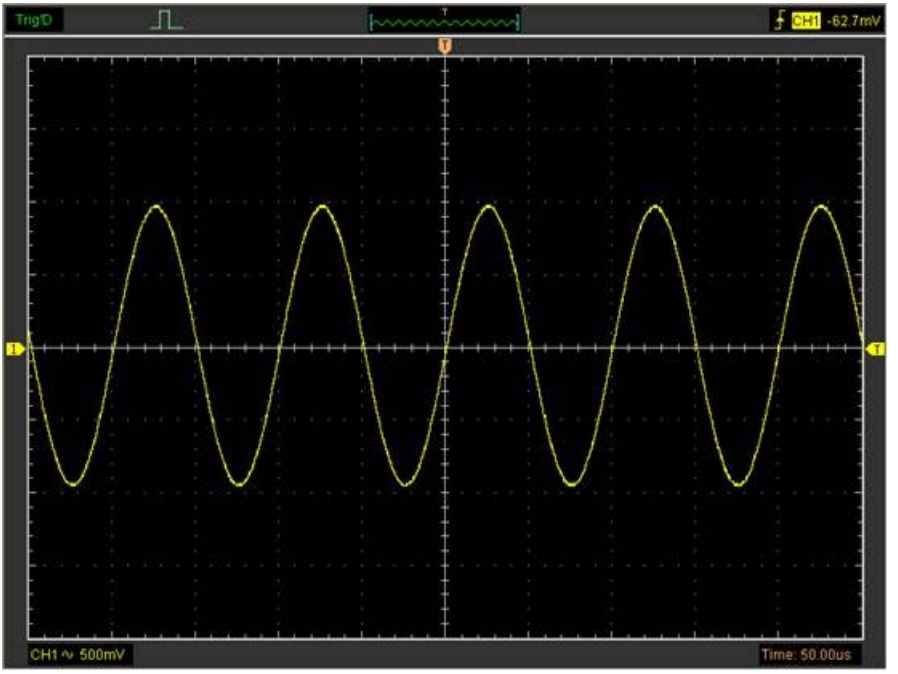
Intensity and Persistence

Select “**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 colour intensity in this dialog.



Zoom In/Out and Drag Waveforms

The software will stop updating a waveform after the user selects the “**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. When you change the position, the waveform will move up, down, right, or left.

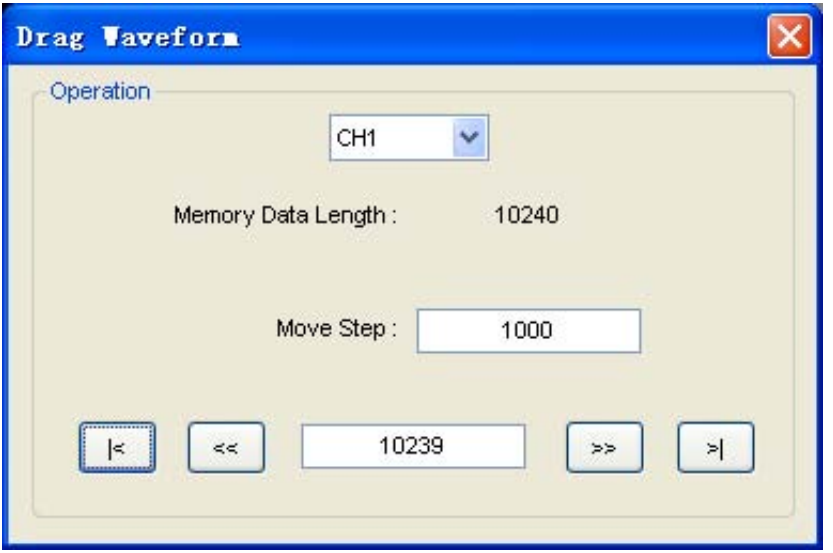
The channel reference indicator identifies each waveform on the display. The indicator points to the reference level of the waveform record.

Zoom In/Out

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

Drag

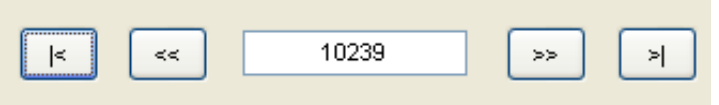
The user can modify the waveform position by selecting “**Drag**” in the“**Acquire**” menu, and then going through the following steps.



1. Select Channel:

2. Set the Move Step:

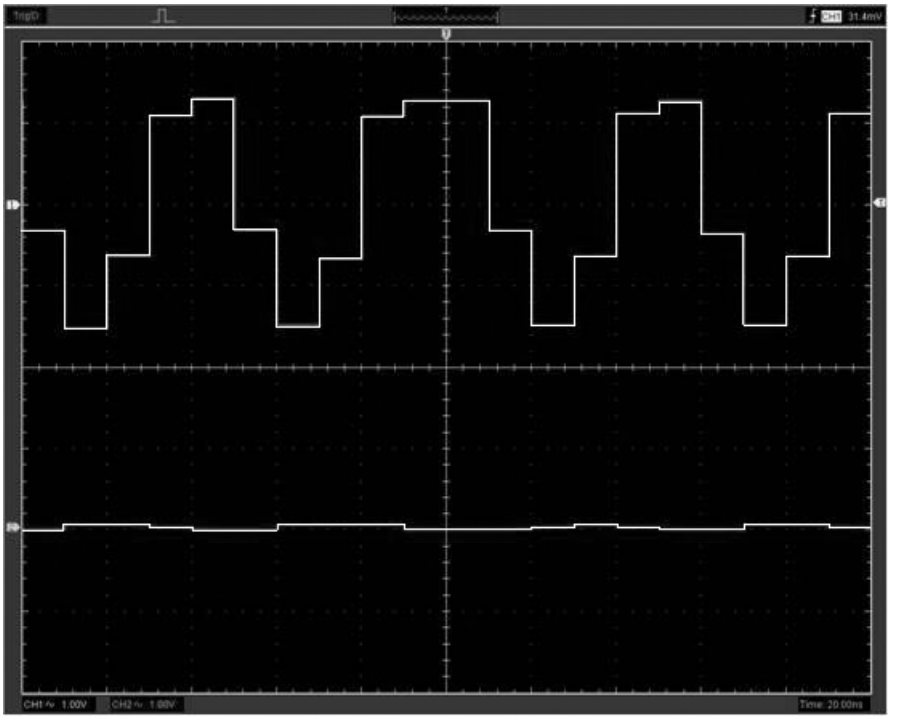
3. Change the waveform position:



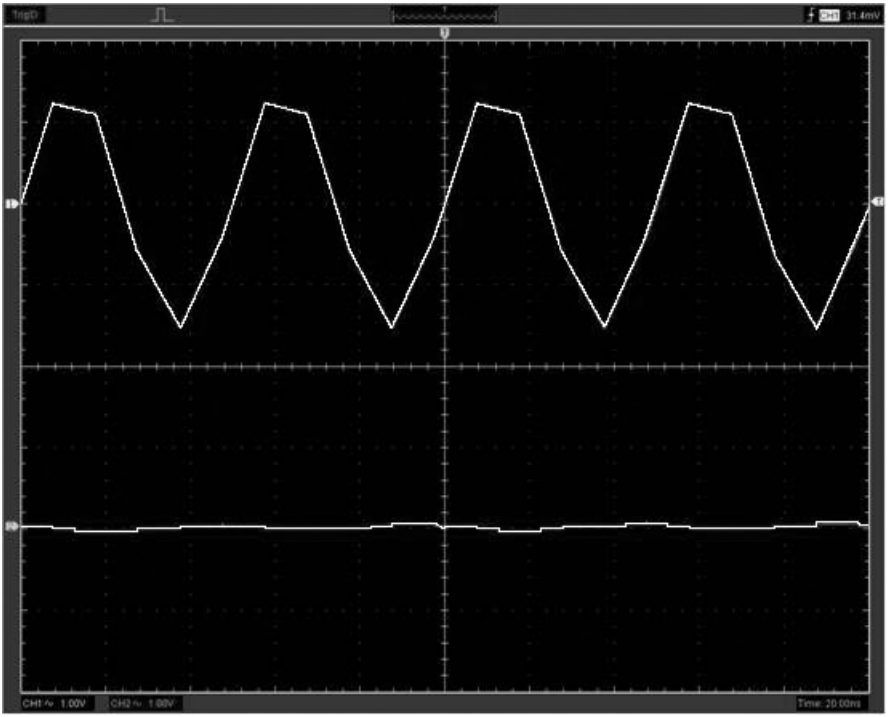
Interpolation

At the time base 40ns/div or faster, the user can select the 3 different interpolation modes to get waveforms of different smoothness.

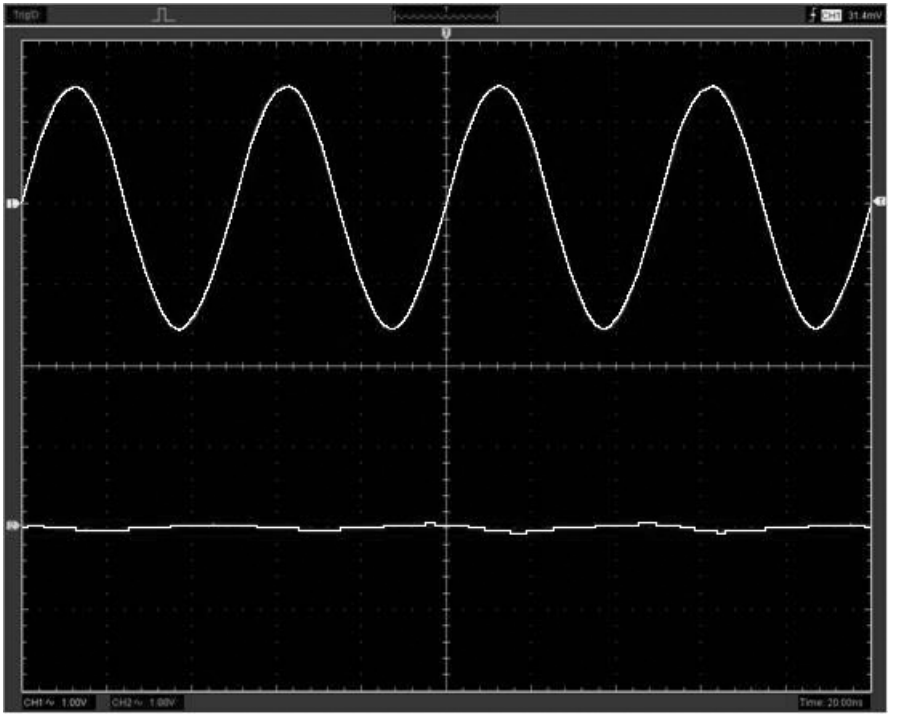
The **Step** Interpolation



The **Linear** Interpolation



The **Sin(x)/x** Interpolation



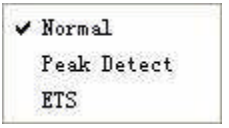
Note: The default interpolation mode is Sin(x)/x.

Acquisition

When you acquire a signal, the oscilloscope converts it into a digital form and displays a waveform. The acquisition mode defines how the signal is digitized and the time base setting affects the time span and level of detail in the acquisition.

Acquisition Modes

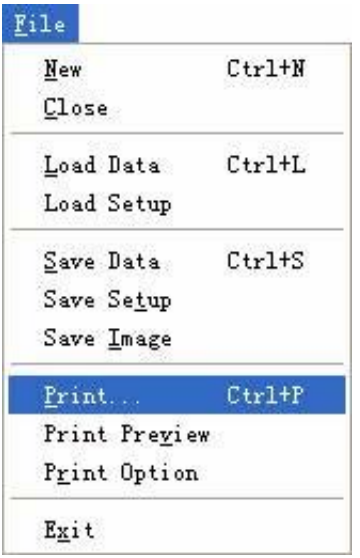
There are two acquisition modes: Normal and Average.



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

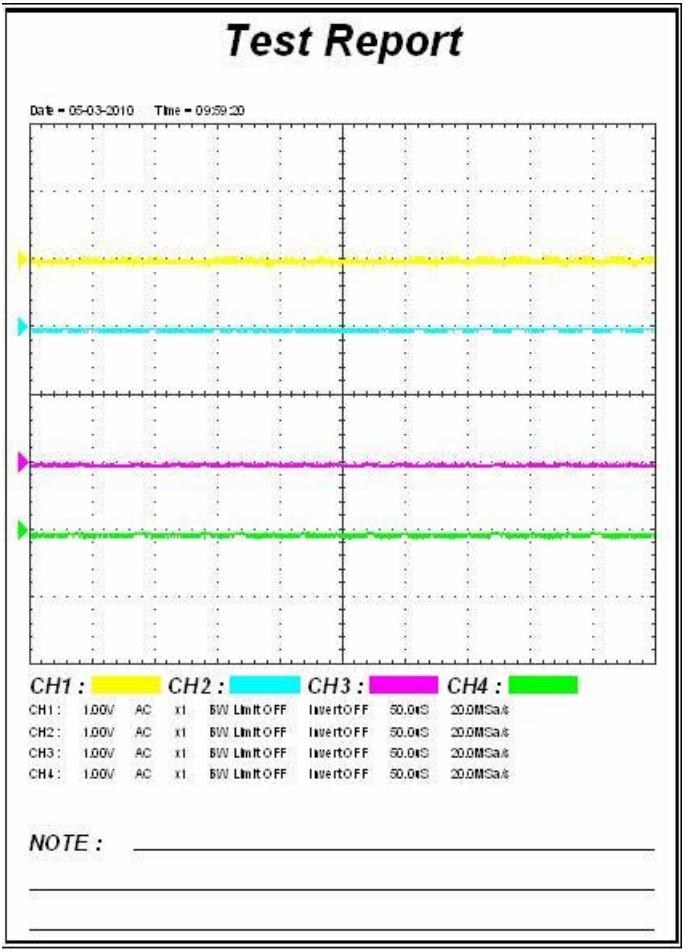
Average: In this acquisition mode, the oscilloscope acquires several waveforms, averages them, and displays the resulting waveform. You can use this mode to reduce random noise.
ETS: In this acquisition mode, you can test high frequency cycle signal.

Print And Print Preview



1. Select “**Print**” in “**File**” menu to set the printer to print the current waveform.

The Print report



2. Select “**PrintPreview**” in th“**File**” menu to get into the Preview window.

In”**PrintPreview**” 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 select the “**Print**” button to print the report.

Chapter 4 Application Example

- **Sample Measurement**
- **Pass/Fail Test**
- **Capturing a Single-Shot Signal**
- **The Application of the X-Y**
- **Taking Cursor Measurement**

Sample 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 -> Auto Setup**" on menu.

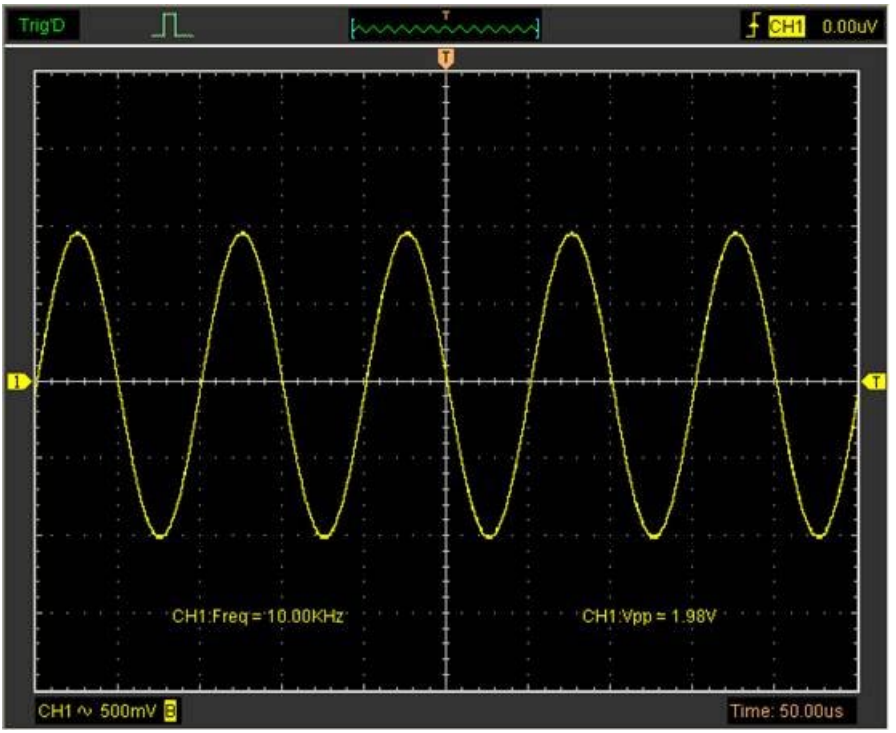
The **TA4000** will set the vertical, horizontal, and triggers controls at the best status automatically. Also, you can adjust the controls to meet your measurement to optimize the waveform display.

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

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

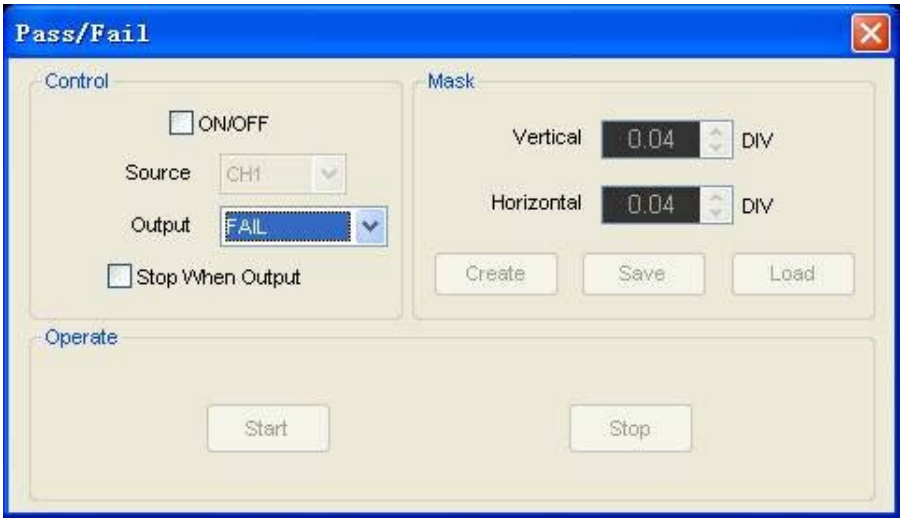
2. Click the "**Measure->Vertical->Peak-to-Peak**" button, the "**Vpp**" of the signal will also display on the bottom of the waveform interface.

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

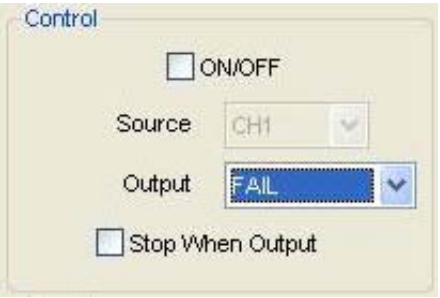

Trig'D
CH1 0.00uV
CH1:Freq=10.00KHz
CH1:Vpp=1.98V
CH1 ∿ 500mV
Time: 50.00us

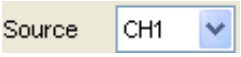
Pass/Fail Test

The **Pass/Fail** function monitors changes of the signals and outputs. It then passes or fails signals by comparing the input signal using the pre-created mask.



Control Setting



Source: 

Select the **Pass/Fail** channel

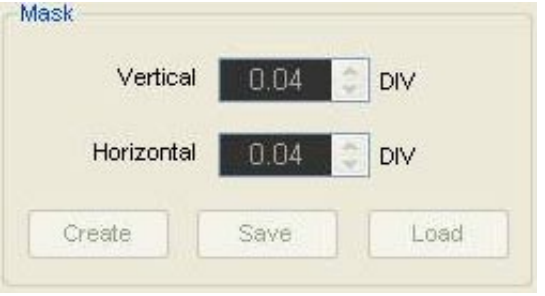
Output:

Select the **Pass/Fail** output condition

Stop When Output:

When selected, the Pass/Fail will stop when the output condition is met.

Mask Setting

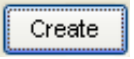


Vertical:

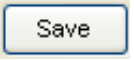
Set the vertical limit range

Horizontal:

Set the horizontal limit range

“Create” button: 

Select to create Pass/Fail area according to the mask

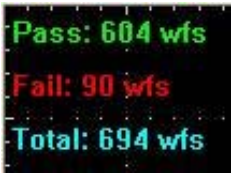
“Save” button: 

Select to save the setups to file.

“Load” button:

Select to load the saved setups file.

Information Display

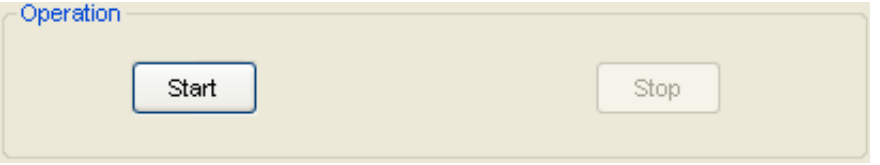


Fail:
Shows the number of failed waveforms

Pass:
Shows the number of passed waveforms

Total:
Shows the total number of waveforms

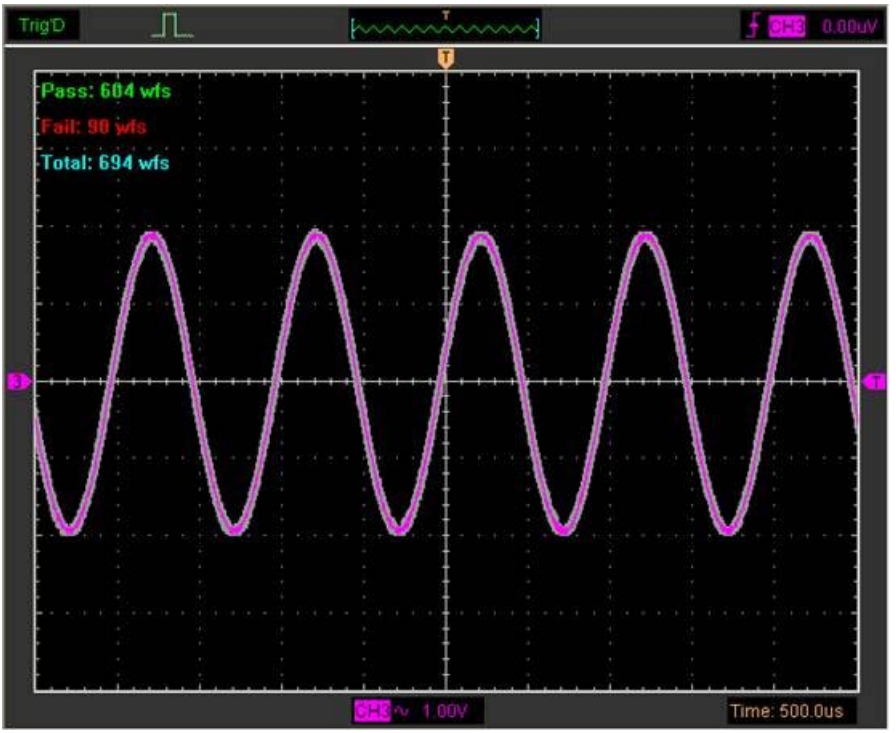
Operation



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

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

The Pass/Fail function display



NOTE: **Pass/Fall** function is unavailable In **X-Y** mode and **Roll** mode.

Capturing a Single-Shot Signal

To capture a single event, it is necessary 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.

Follow the steps below:

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 have selected the rising edge.

5) Adjust the Volts/Div and the time base to a suitable range for the signal.

6) Drag the trigger level sign on the waveform display screen to a suitable position. It’s usually slightly higher than the normal level.

7) Select **START** 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 slightly higher than the normal level and press and wait. When the noise occurs, the instrument will record the waveform before and after the trigger.

The Application of the X-Y Operation

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

Follow the steps below:

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.

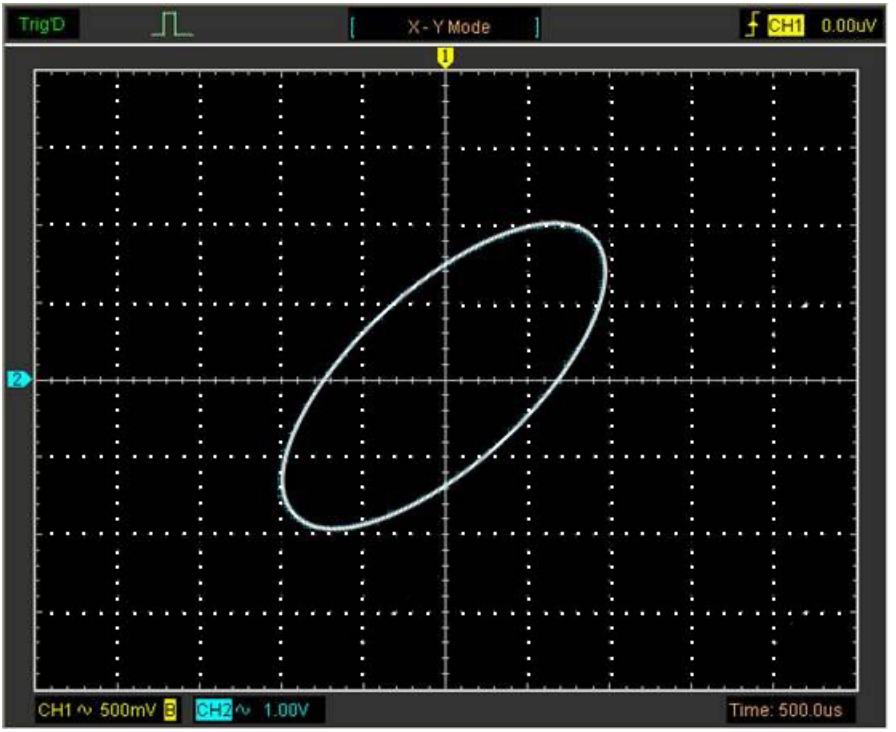
3. Adjust the vertical scale and offset to display approximately the same amplitude signals on each channel.

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

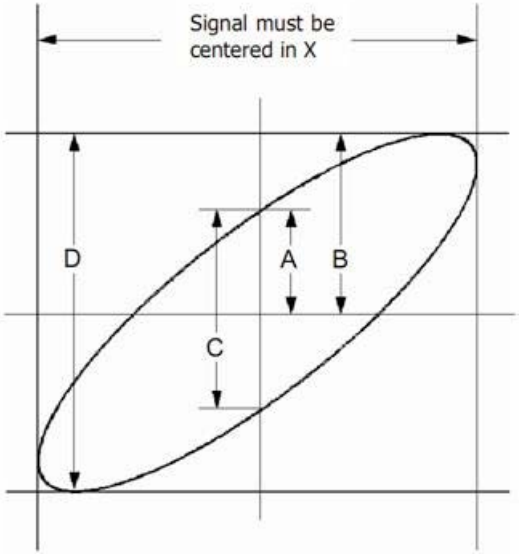
5. Adjust the scale and offset of the horizontal and vertical to a desirable waveform display. The following picture shows a typical example.

6. 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).

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

Follow these steps:

1. Select “**Cursor->Source**”, select CH1 (select CH2 if you want measure CH2).

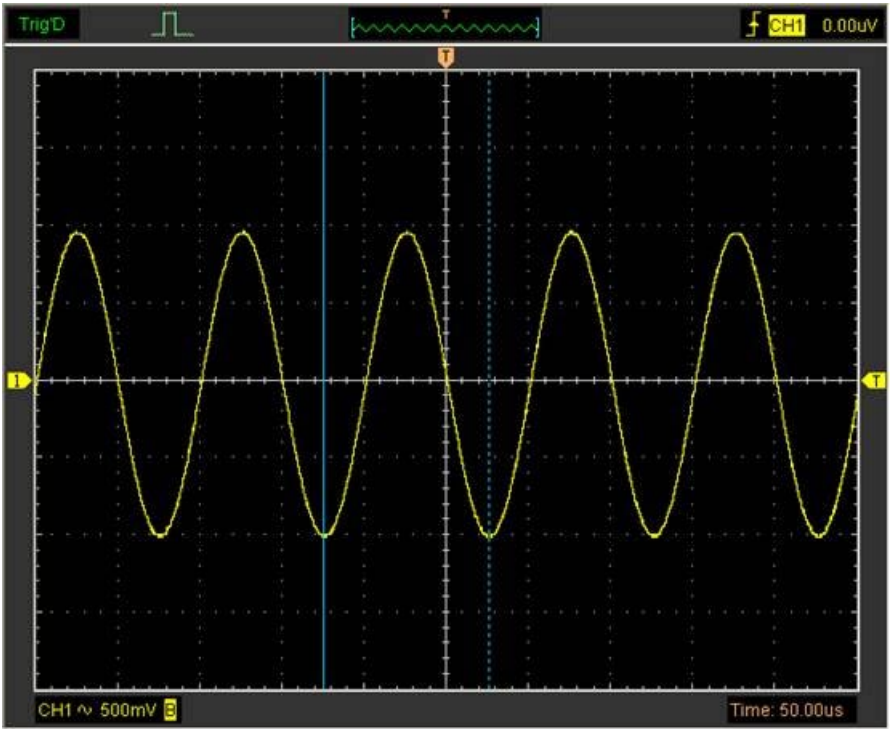
2. Select “**Cursor->Type**”, select Vertical.

3. Click the 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 the time.



Readings are shown in the status bar.

Freq: 9.913KHz Time: 101uS

Measure the Amplitude of the First Waveform Peak of the Waveform

Follow these steps:

1. Select "**Cursor->Source**", select CH1 (select CH2 if you want measure CH2).

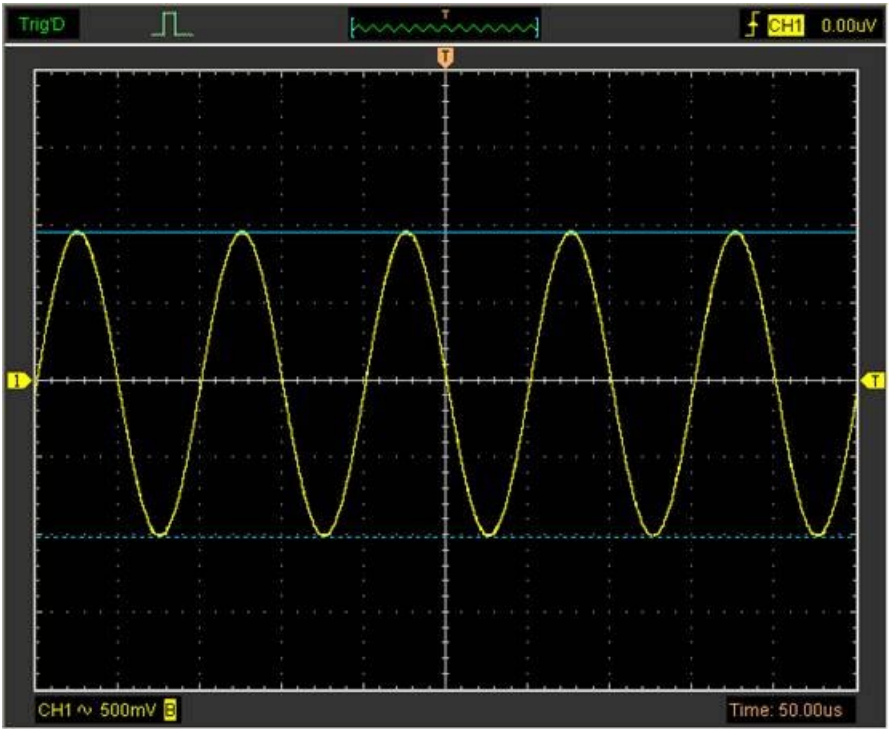
2. Select "**Cursor->Type**", select Horizontal.

3. Click the left mouse button, and the Horizontal lines appears.

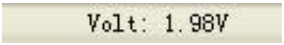
4. Drag the mouse button to the point you want to measure.

5. Release the left mouse button, the voltage difference will be shown in the status bar.

Measure the Amplitude:



Readings are shown in the status bar.



Trace the Amplitude of a fixed position on X-axis in a Waveform

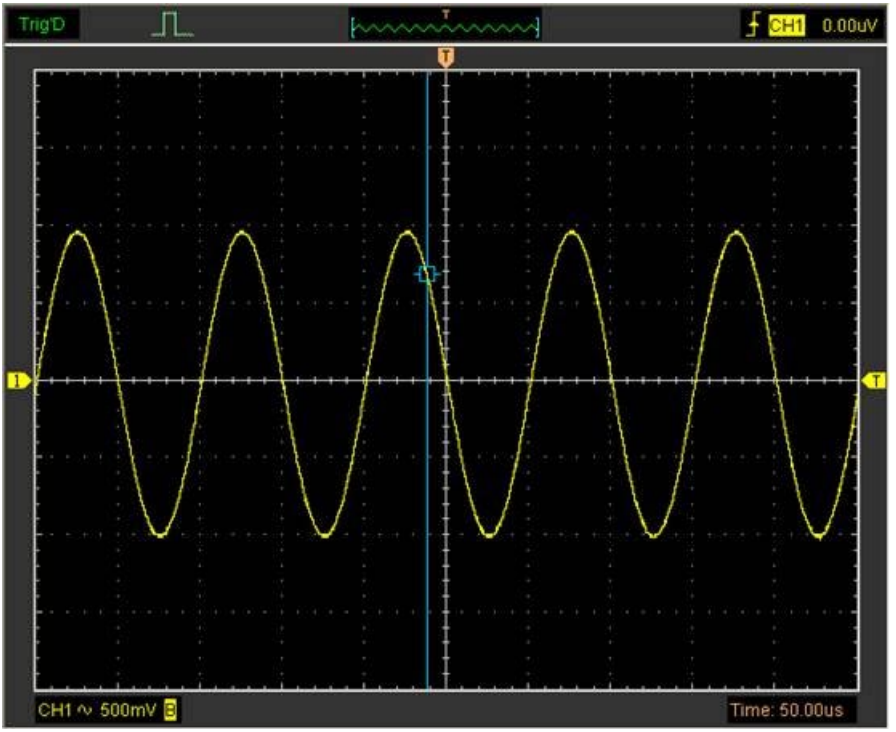
Follow these steps:

1. Select "**Cursor->Source**", select CH1 (select CH2 if you want to trace CH2).

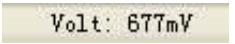
2. Select "**Cursor->Type**", select Trace.

3. Select the cursor at the position that you want to trace the wave in the waveform window.

Trace the Amplitude:



Readings in the status bar.



Note: Select "**Cursor->Type**", select "**Cross**", you can measure time and amplitude in this one set position

.

Chapter 5 Appendix

- **Appendix A: Specifications**
- **Appendix B: General Maintenance**

Appendix A: Specifications

Specifications Table:

Input	
Max. sample rate	200MS/s (Single Channel) 100MS/s (Dual Channels)
Channels	4 Channels
Bandwidth	60MHz (-3dB)
Vertical resolution	8 bits/channel
Gain range	10mV ~ 5V/div @ x1 probe(10mV, 20mV, 50mV, 100mV, 200mV, 500mV, 1V, 2V, 5V/div1,2,5 sequence) 100mV ~ 50V/div @ x10 probe 1V ~ 500V/div @ x100 probe 10V ~ 5KV/div @ x1000 probe
Range	8 divisions
Offset level	+/-4 divisions
Coupling	AC, DC,GND
Offset increments	0.02 div
Impedance	1M ohm
DC accuracy	+/-3%
Input protection	35Vpk (DC + peak AC < 10 kHz, without external attenuation)
Display Mode	Y-T, X-Y
Timebase	
Timebase range	5ns/div ~ 1000s/div(1-2-5 sequence)
Acquisition mode	Realtime sampling: 5ns /div ~ 200ms/div. Roll mode: 500ms/div ~ 1000s/div
Range	10 divisions
Buffer Size	10K ~ 16M points (Single Channel)
Trigger	
Type	Edge trigger, Pulse trigger
Mode	Auto, Normal and Single
Autoset	Yes
Range	10 divisions

Trigger level	+/-4 divisions
Accuracy	0.02 div increments
Math	
Measurements	Vpp, Vmax, Vmin, Vmean, Vrms, Vamp, Vtop, Vbase, Vmid,positive overshoot, negative overshoot, cycle mean, cycle RMS, period, frequency, positive pulse width, negative pulse width, rise time (10%~90%), fall time (10%~90%), positive duty cycle, negative duty cycle
Math	Addition, Subtraction, Multiplication, FFT
FFT	Rectangular, Hanning, Hamming, Blackman Window
Physical	
Interface	USB2.0 (USB1.1 compatible)
Power	External power source required.(8.5v dc)
Dimensions	224 x168 x 37(mm)

Appendix B: 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 damage to the device or probes, do not expose them to sprays, liquids or solvents.

Cleaning
Inspect the device and probes as often as operating conditions require. Make sure the device is disconnected from 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 dampened cloth with water to clean the device.

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

SEALEY POWER PRODUCTS

EC DECLARATION OF CONFORMITY

We the sole importers into the UK, hereby declare that the equipment described below

Description and Function: **Automotive Diagnostic Oscilloscope 4 Channel**

Model/Type: **TA4000**

Manufacturing Date / Serial number (optional): .....

Manufacturer's authorised representative within the EC: **Jack Sealey Ltd. Kempson Way, Suffolk Business Park, Bury St. Edmunds, Suffolk, IP32 7AR**

Conforms to the requirements of the following Directives, as indicated.

- ☐ 2006/42/EC Machinery Directive
- ☒ 2006/95/EC Low Voltage Directive
- ☒ 2004/108/EC EMC Directive
- ☒ 93/68/EEC CE Marking Directive
- ☐ 2009/105/EC the Simple Pressure Vessels Directive
- ☐ 2000/14/EC Outdoor Noise Emissions Directive
- ☒ 2002/96/EC WEEE Directive
- ☒ 2002/95/EC RoHS Directive
- ☐ 97/23/EC Pressure Equipment Directive

And the following harmonised standard(s)

BS EN 61010 part 1: 2010

BS EN 61010 part 031: 2002 + A1: 2008

BS EN 61326 part 2-1: 2006

BS EN 61000 part 4-2: 2009

BS EN 61000 part 4-3: 2006 + A1: 2010

BS EN 55022: 2006 + A2: 2010

Additional technical standards and specifications (if applicable): .....

Technical file compiled by: **Jack Sealey Ltd**.

Signed: .....

Date: 17-Aug-2011

Place: Bury St.Edmunds.

Name: Tim Thompson

Position: Commercial Director

Being the responsible person appointed by the manufacturer.

CE

Sealey Power Products, Kempson Way, Suffolk Business Park, Bury St. Edmunds, Suffolk, IP32 7AR
01284 757500 | 01284 703534 | sales@sealey.co.uk | www.sealey.co.uk