



## USER'S MANUAL

Hantek6102BE

Hantek6212BE

[www.hantek.com](http://www.hantek.com)

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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.**

## Safety Information

In order to ensure the correct using and the best efficient service, please carefully read the user's manual.

### System Symbols

These symbols may appear in this manual or on the instrument.



**Warning:** "Warning" identifies conditions and actions that pose hazards to the users.



**Caution:** "Caution" identifies conditions and actions that may damage the product or other properties.



DANGER:  
High Voltage



Refer to  
the manual



Protective  
Conductor Terminal



Chassis ground



Earth(ground)  
Terminal

### System Terms

The following terms may appear on the instrument:

**Danger:** The term "Danger" is used in the manual to indicate that when you read this mark, personal injury may be caused to immediately.

**Warning:** The term "Warning" is used in the manual to indicate that when you read this mark, personal injury may not be caused to you immediately, but you need to be cautionary.

**Notice:** The term "Noise" is used in this manual to indicate that damages may be caused on this product or other properties.

# 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**
- ◆ **General Check**
- ◆ **Probe Compensation**
- ◆ **Self Calibration**
- ◆ **Function Check**
- ◆ **Accessories**

## 1.1 System Requirement

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

### Minimum System Requirements

#### Operating System

Windows XP/Vista/Win 7/Win 8

#### 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

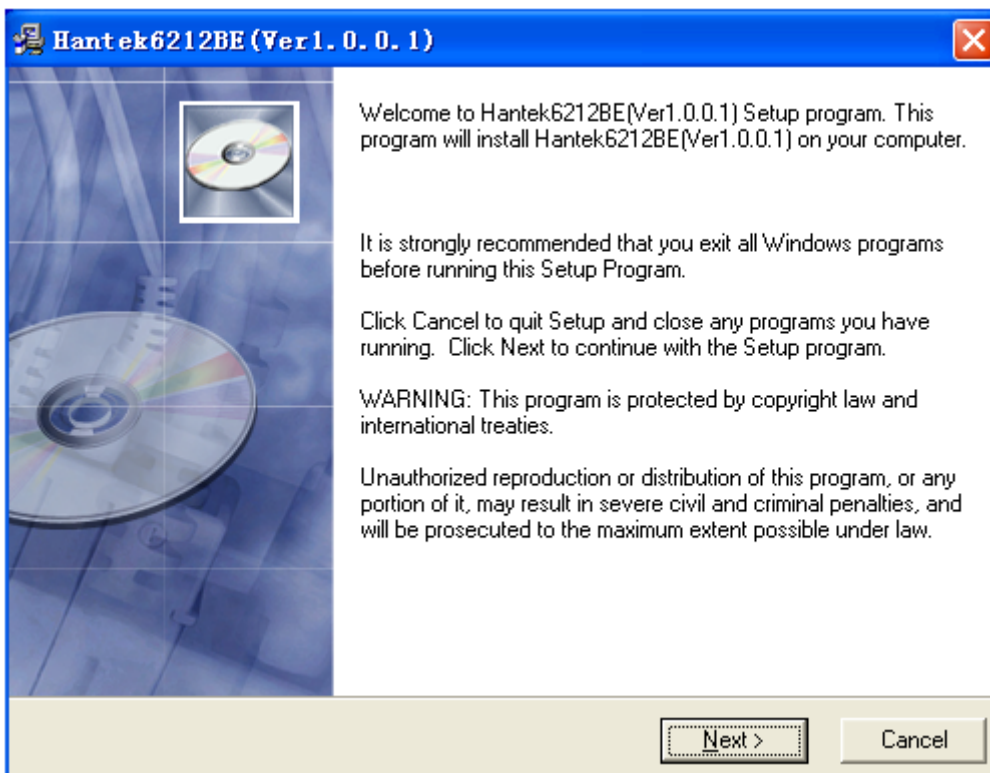
**Caution:** You must install the software before using the oscilloscope.

Example: Hantek6212BE

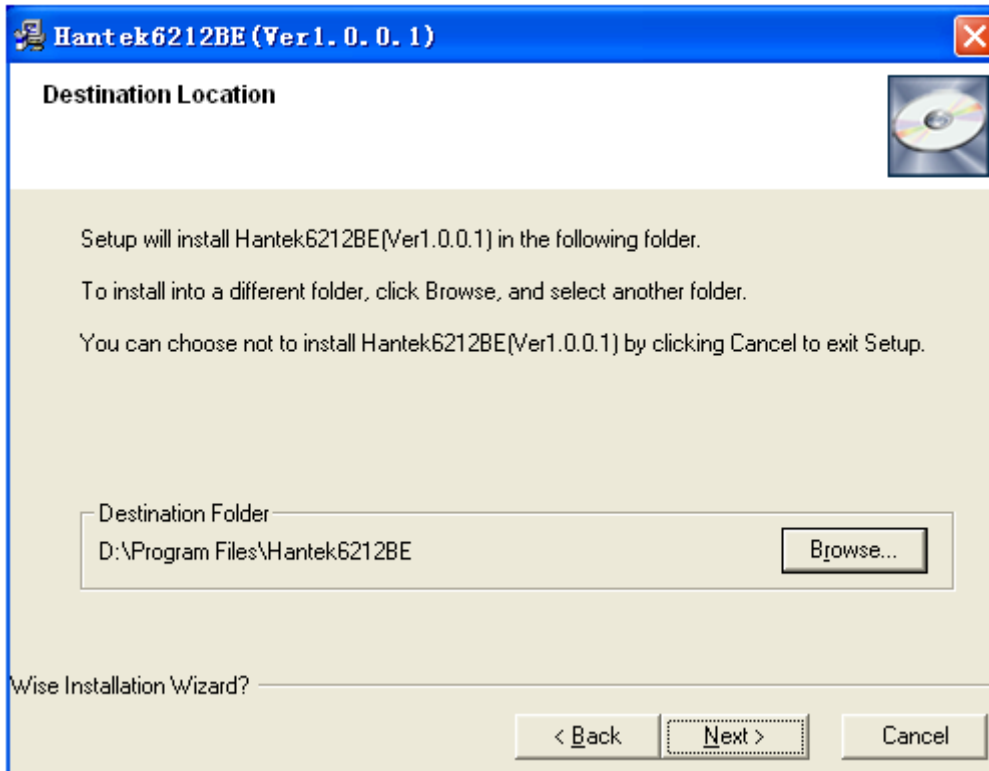
1. While in Windows, insert the installation CD into the CD-ROM drive.
2. The installation should start up automatically. Otherwise in Windows Explorer, switch to the CD-ROM drive and run Setup.exe.



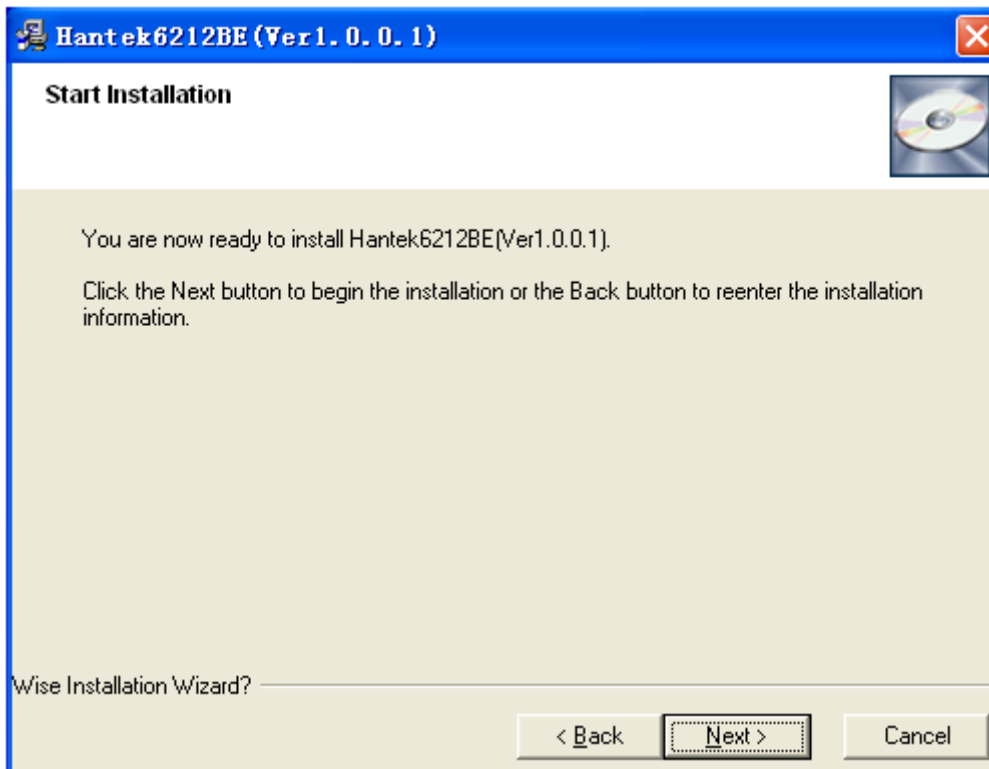
3. The software Installation is started. Click 'Next' to continue.



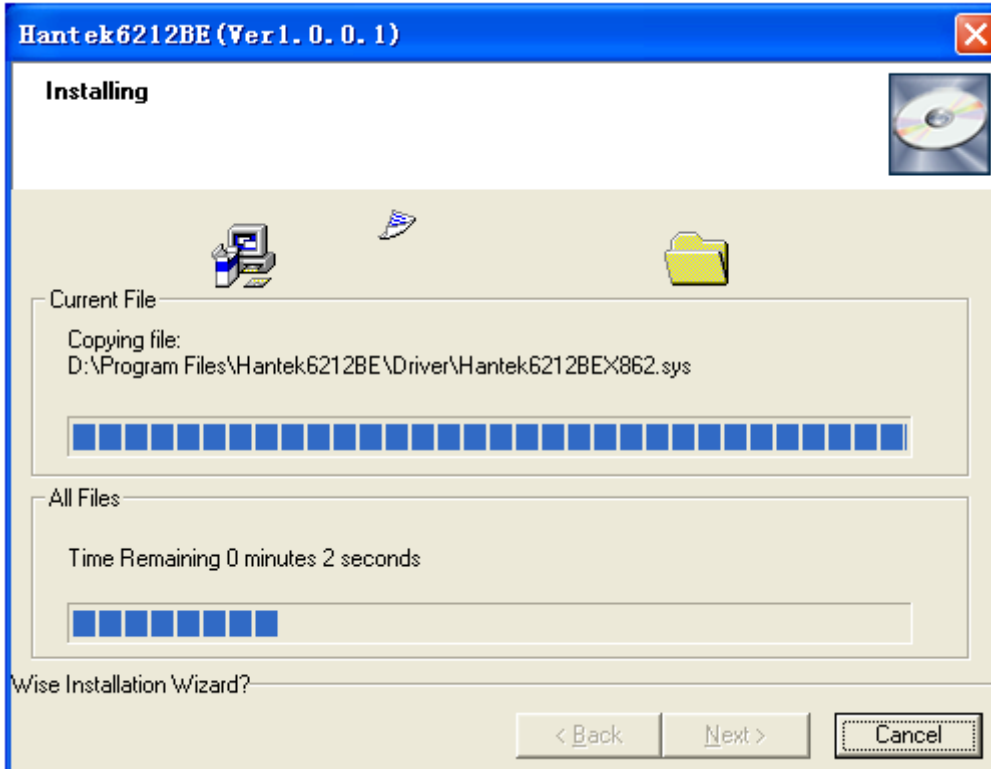
4. Choose a destination directory. Click 'Next' to continue.



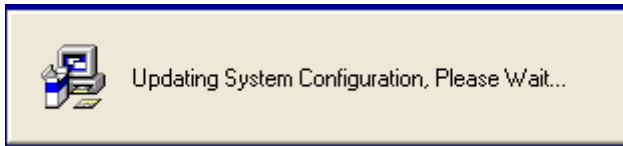
5. Check the setup information. Click Next to start copying of files.



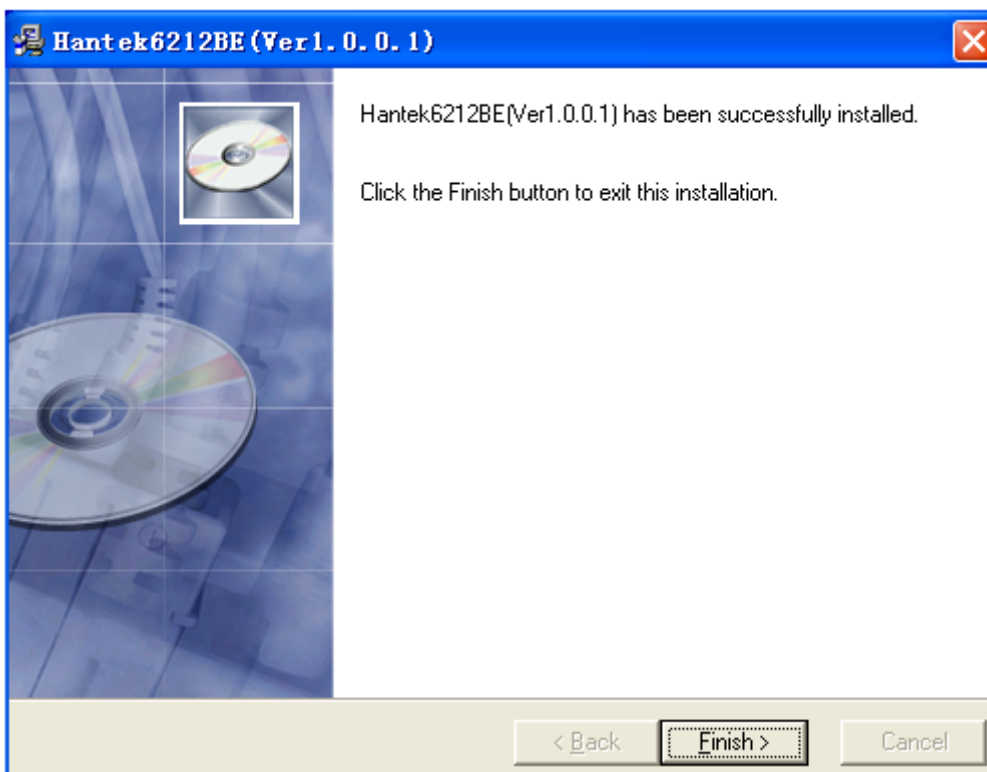
6. This Status dialog is displayed during copying of files.



7. Updating Your System Configuration.



8. The installation is complete.



## 1.3 Install Driver

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



2. Connect the B-Type Plug of USB cable to Hantek6212BE's USB port.



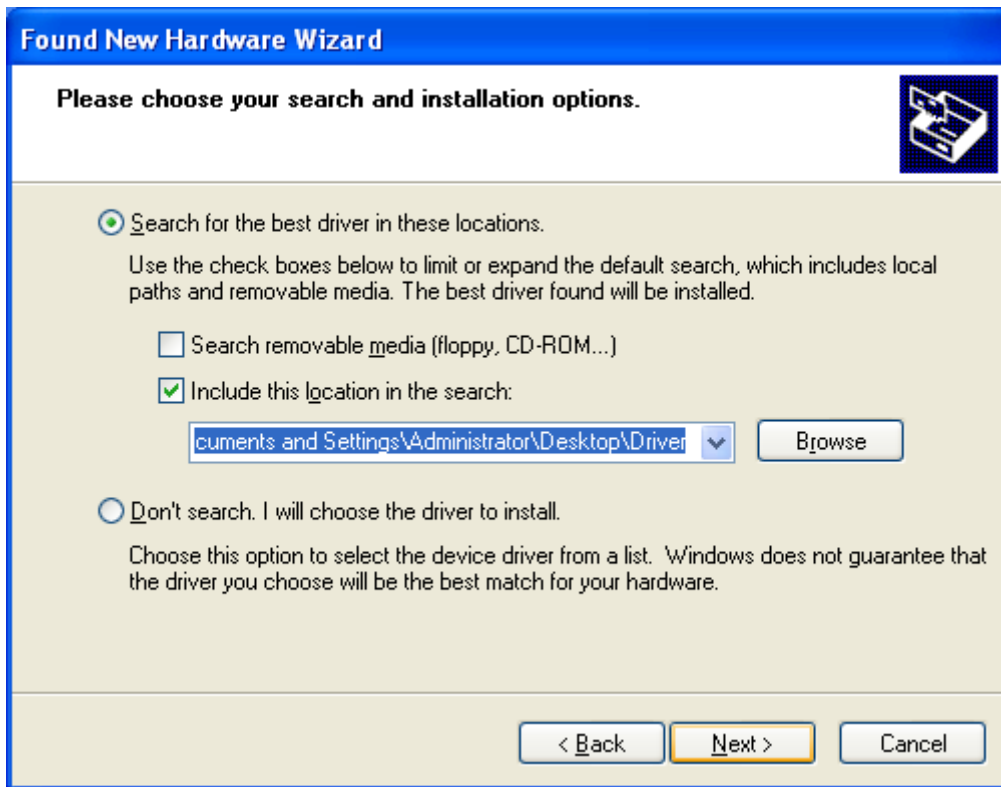
3. New hardware is found.



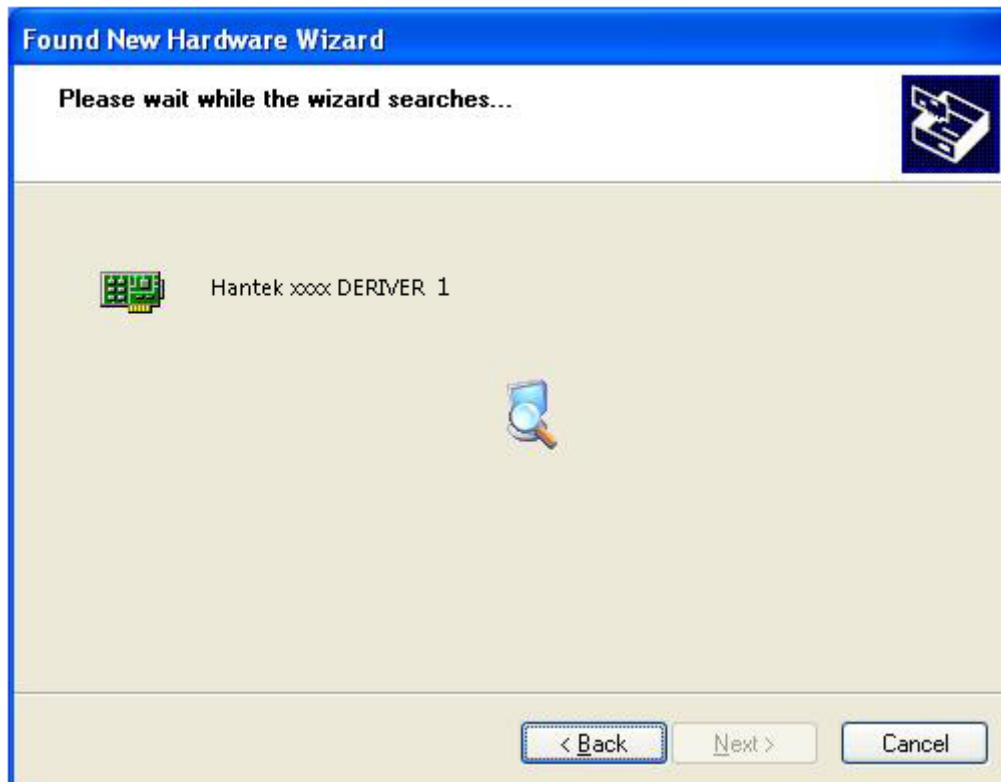
4. New hardware search wizard starts.



5. New hardware search wizard starts to search the drive.



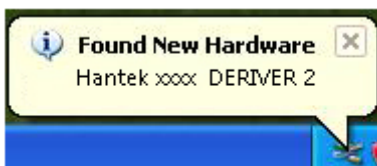
6. New hardware wizard installs software



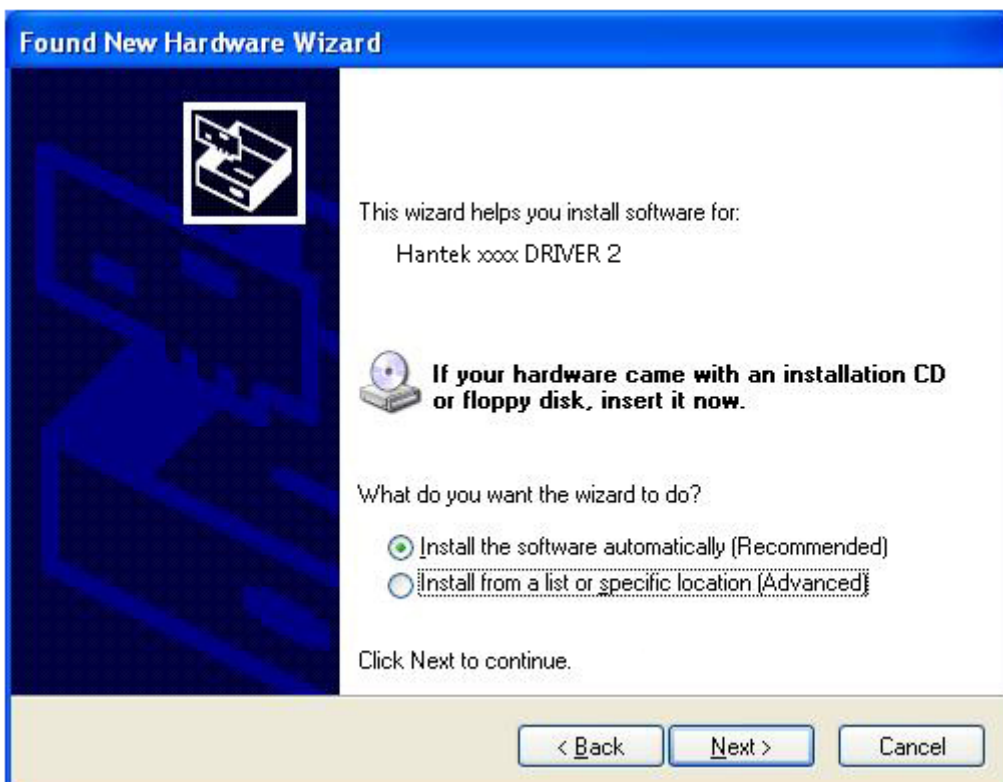
7. Finish new hardware search wizard.



8. New hardware is found.



9. Found new hardware Wizard. Select "Install the software automatically".



10. New hardware wizard installs software and finish new hardware search wizard.



11. Your new hardware is installed and ready to use.



## 1.4 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.

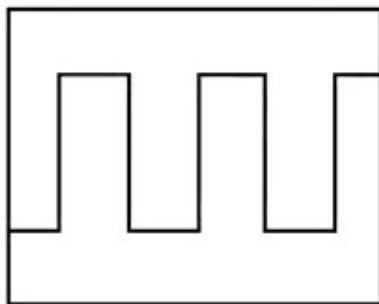
### Check the instrument:

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

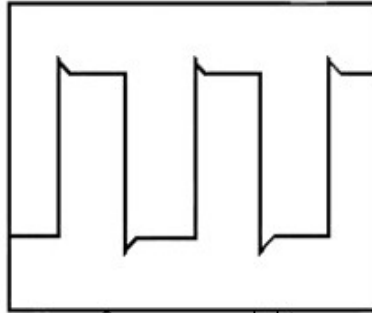
## 1.5 Probe Compensation

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.

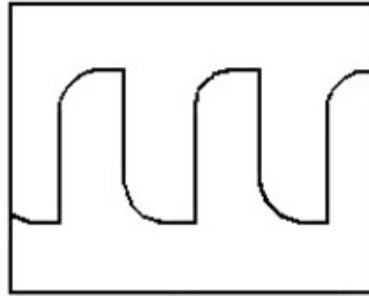
- ◆ From the "Probe" menu, select attenuation to 1:10. Set the switch to "X10" on the probe and connect it to CH1 of the oscilloscope. When using the probe hook-tip, insert the tip onto the probe firmly to ensure a proper connection.
- ◆ Attach the probe tip to the Probe Compensator and the reference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

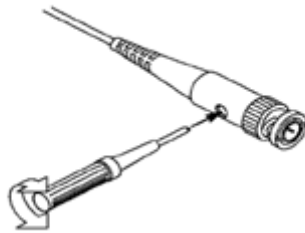


Over compensated



Under Compensated

- ◆ 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.



- ◆ Repeat if necessary.

**WARNING:** 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.

## 1.6 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 5v 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.

## 1.7 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 B-Type Plug of USB cable to oscilloscope USB port.



### ◆ Input a signal to a channel of the oscilloscope

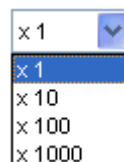
The oscilloscope is equipped with two channels plus external trigger.

**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, 2V, peak- to- peak).

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

## 1.8 Accessories

All the accessories listed below are standard accessories for the oscilloscope:

- ◆ Probe x 2 (1.5m), 1:1, (10:1) Passive Probes
- ◆ A USB Cable
- ◆ A PC software of the oscilloscope

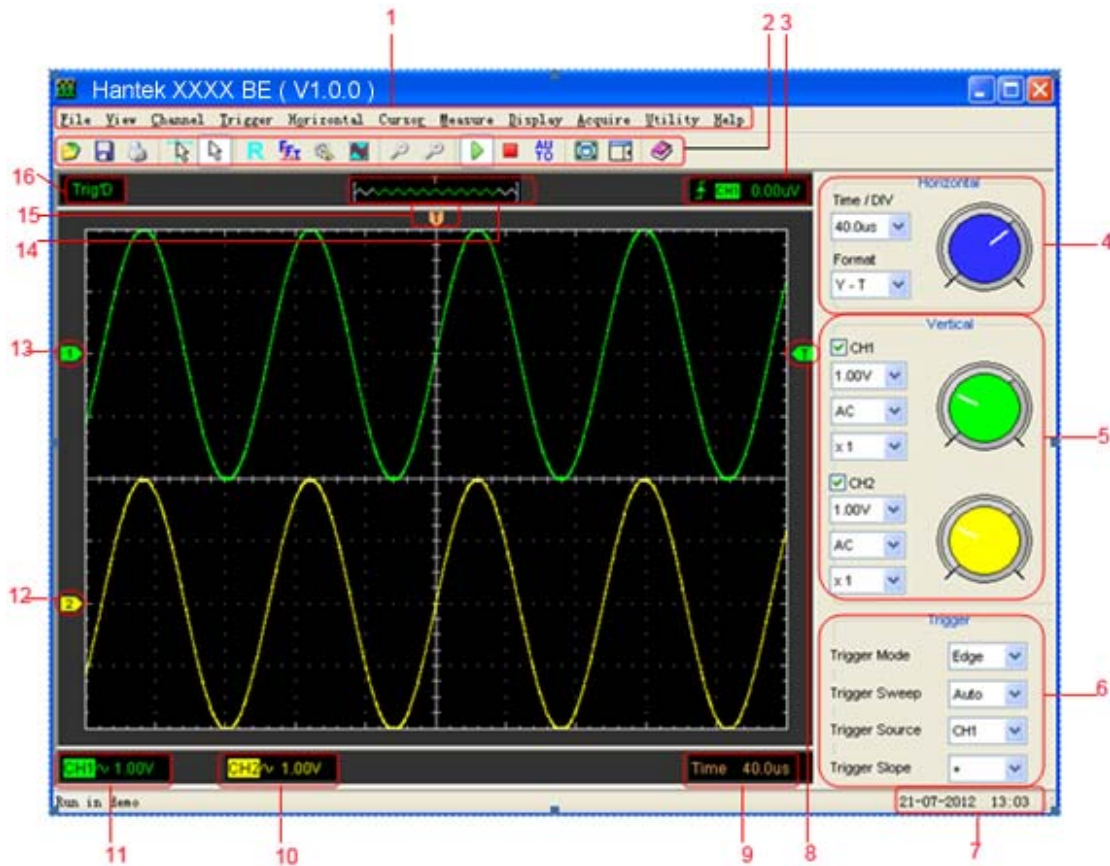
# Chapter 2 Operating Basics

- ◆ The User's Interface
- ◆ The Menu System
- ◆ The Horizontal System
- ◆ The Vertical 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:



### 1. The Main Menu

All setting can be found in the main menu.

### 2. The Toolbar

### 3. Displays the trigger information

Displays the edge trigger slope, source and level.

### 4. The Horizontal Panel

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

### 5. The vertical Panel

The user can turn on/off the CH1/CH2. Also the user can change the CH1/CH2 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. Displays the system time.

### 8. Displays the main time base setting.

### 9. Marker shows Edge trigger level.

### 10. Displays the CH2 information

Readout show the coupling of the channels.

Readout show the vertical scale factors of the channels.

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

#### **11. Displays the CH1 information**

Readout show the coupling of the channels.

Readout show the vertical scale factors of the channels.

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

#### **12. The marker shows the reference points of the displayed waveforms.**

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

#### **13. The same as 13.**

#### **14. A window that shows the display waveform in buffer position.**

#### **15. Marker shows horizontal trigger position.**

#### **16. Trigger status indicates the following.**

**Auto:** The oscilloscope is in auto mode and is acquiring waveform waveform 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.

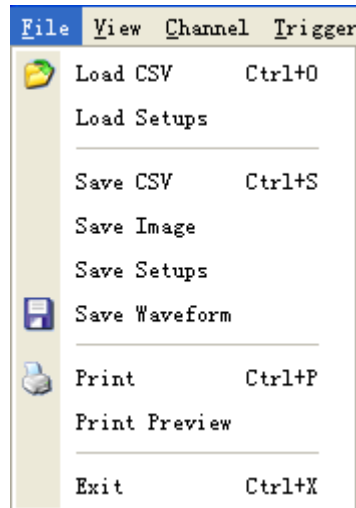
**Play:** The oscilloscope is displaying the record waveform.

## 2.2 The Menu System

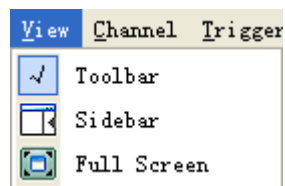
The Main Menu:

File View Channel Trigger Horizontal Cursor Measure Display Acquire Utility Help

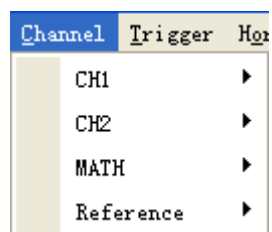
**1. File:** Load or save CSV, waveform and setup



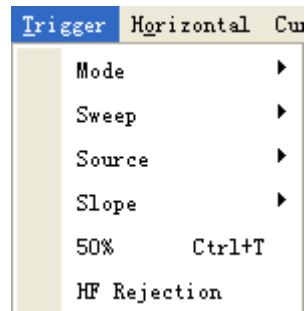
**2. View:** Change the user interface



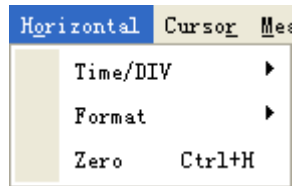
**3. Channel:** Set the vertical system



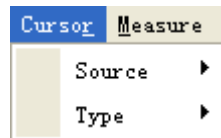
**4. Trigger:** Change trigger Mode, Sweep, Source, Slope and so on.



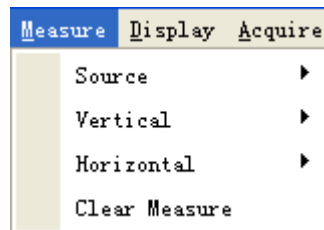
**5. Horizontal:** Sets time base parameters and format parameters.



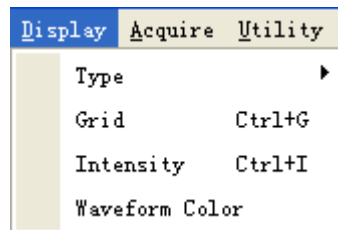
**6. Cursor:** Set cursor measure type



**7. Measure:** Set measurement parameters

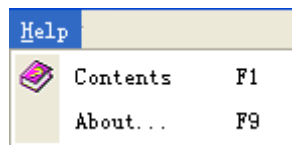


**8. Display:** Change wave display type and color.



**9. Acquire:** Start, Stop, Autoset and other operation setting

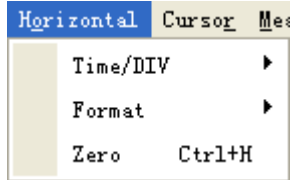


**10. Utility:** Utility setting**11. Help:** Turn on help file

## 2.3 The Horizontal System

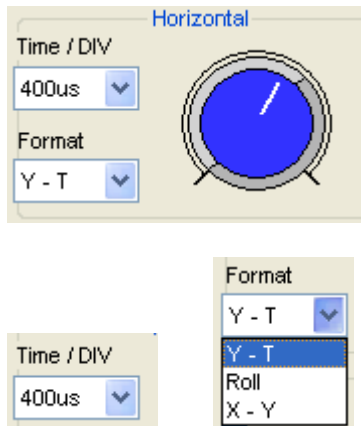
Click “**Horizontal**” in main menu.

The following figure shows the horizontal parameters setting.



1. **Time/DIV**: leads the setting of the time base parameters
2. **Format**: leads the setting of the horizontal format parameters

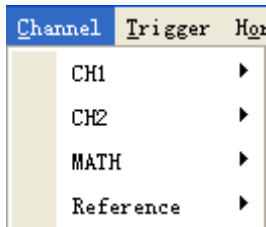
Of course, the user can also set the parameters in the right sidebar.



## 2.4 The Vertical System

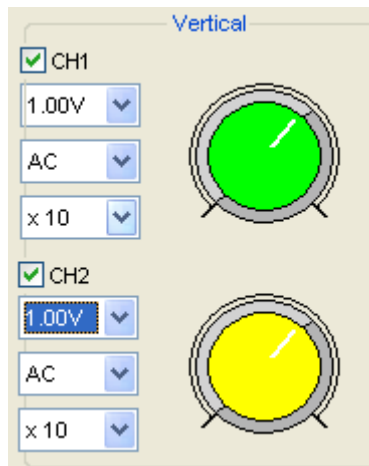
Click “**Channel**” in main menu.

The following figure shows the vertical parameters setting.



- ◆ **CH1**: Leads to the setting of the Ch1 parameters
- ◆ **CH2**: Leads to the setting of the Ch2 parameters
- ◆ **Math**: Leads to the setting of the Math parameters
- ◆ **Reference**: Leads to the setting of the Reference parameters

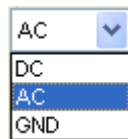
You can also set parameters in the right sidebar.



1. Select channel:  CH1  CH2
2. VLTSDIV: Set the selected channel voltage range.



3. Coupling: Set the selected channel to DC, AC and GND.

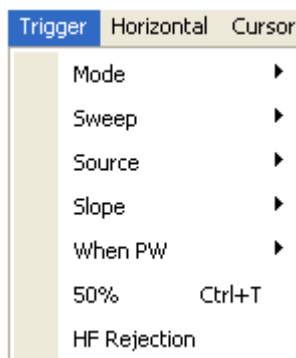


4. BW Limit: Reject the frequency component higher than 20MHz.

## 2.5 The Trigger System

Click “**Trigger**” in main menu.

The following figure shows the trigger system control.



1. **Mode**: Sets the trigger mode to **Edge** trigger
2. **Sweep**: Selects the trigger sweep mode to **AUTO**, **NORMAL** or **SINGLE**
3. **Source**: Selects the trigger source to **CH1**, **CH2**, **ALT**, **EXT.**, **EXT./10**.
4. **Slope**: Selects the edge trigger slope to **Positive** or **Negative** slope

5. **When PW:** Selects the pulse width trigger condition
6. **50%:** Sets the trigger level to the center of the waveform amplitude
7. **HF Rejection:** Eliminates trigger high-frequency (20M above)

The user can drag the trigger icon to adjust the trigger level and the trigger level will be displayed on the top right corner.

## 2.6 Input Connectors



**CH 1/CH 2:** Input connectors for waveform display.

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

### Other Connector:



**GND.:** Ground terminal

**USB PORT:** Connect the B-Type Plug of USB cable to this port.

**CAL.:** Probe compensation output.

# Chapter 3 Functions

- ◆ **Set Oscilloscope**
- ◆ **Set Vertical System**
- ◆ **Set Horizontal System**
- ◆ **Set Trigger System**
- ◆ **Measure Signal**
- ◆ **Utility Function**
- ◆ **The Display System**
- ◆ **Save/Load**
- ◆ **Print**



## 3.1 Setup the Oscilloscope

### Use “AUOSET” 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 when you run the software next time. You can use the “**Save Setup**” menu to permanently save setting.

### Load Setup

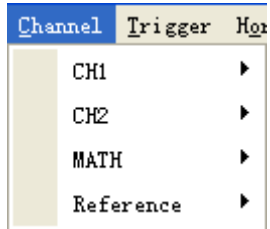
The oscilloscope can recall the last setup before the oscilloscope software was running, any saved setups, or the factory setup. You can use the “**Load Setup**” menu to permanently recall setup.

### Factory Setup

The oscilloscope software is set up for normal operation when it is shipped from the factory. This is the factory setup. Push the “**Factory Setup**” menu to recall this setup.

## 3.2 Set Vertical System

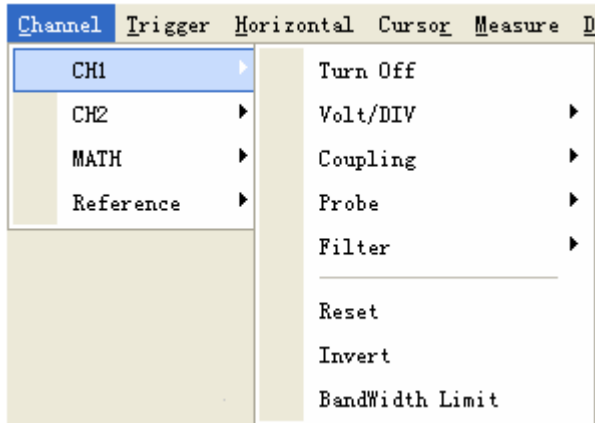
Click “Channel” in main menu.



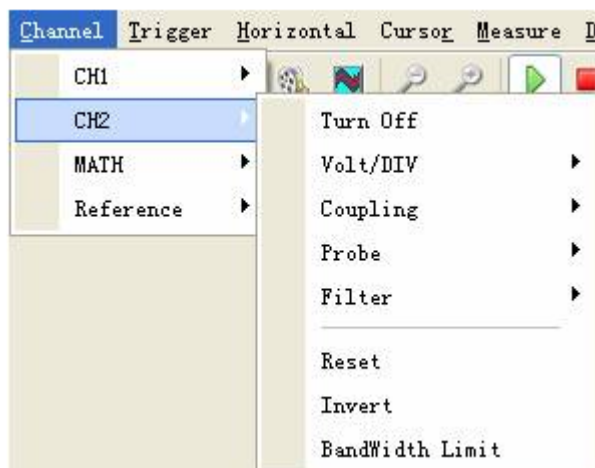
### 3.2.1 Change CH1/CH2

Click “CH1/CH2” in “Channel” menu.

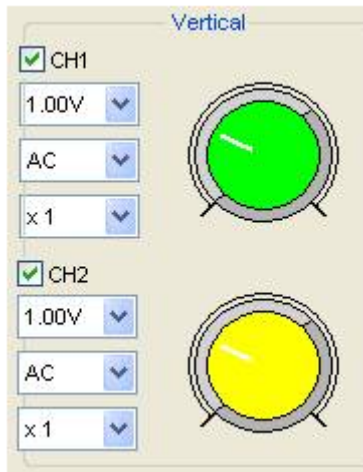
The CH1 Menu:



The CH2 Menu:



The CH1/CH2 control panel in sidebar:



### The Vertical function:

**Turn ON/OFF:** Turn on/off the channel

**Volt/DIV:** Select the channel voltage/div

**Coupling:** Select the channel coupling

**Probe:** Select the channel probe attenuation

**Filter:** Select software filter

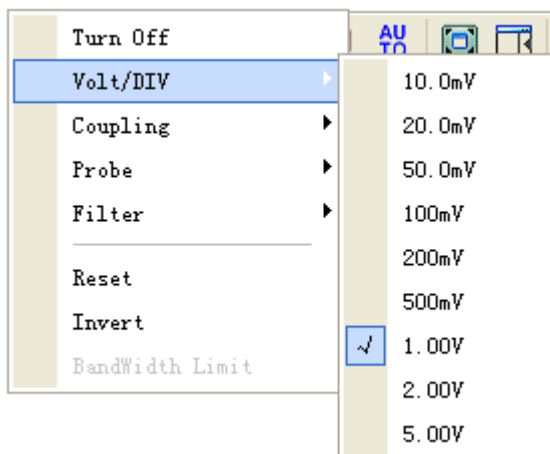
**Reset:** Set the channel vertical position to zero

**Invert:** Turn on/off the invert function.

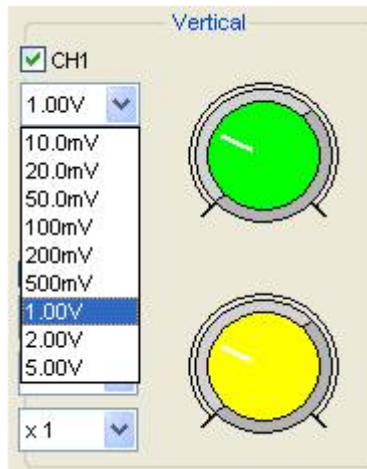
**Bandwidth Limit:** Limit the channel bandwidth to 20MHz to reduce noise.

### Change Volt/DIV

You can click “**Volt/Div**” in “**CH1/CH2**” to select the voltage.



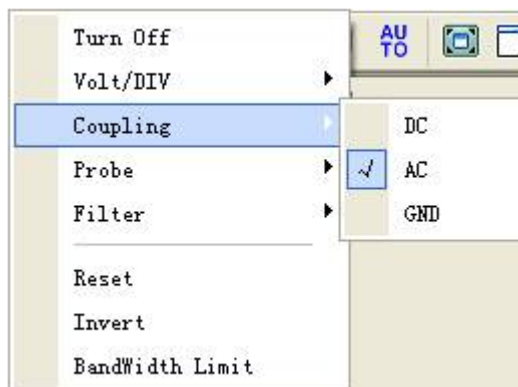
You can also change “**CH1/CH2**” voltage in side bar.



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

### Set Channel Coupling

Click “**Coupling**” in “**Channel**” menu.



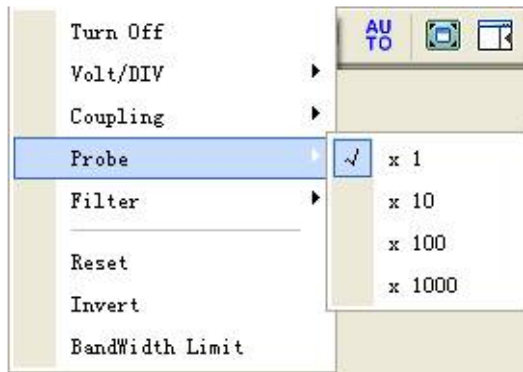
You can set the coupling to **DC**, **AC** or **GND**. If you set the coupling to **DC**, it blocks the **AC** component of the input signal.

### Probe Attenuation Setting

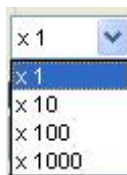
Select the attenuation factor for the probe. To check the probe attenuation setting, toggle the probe menu to match the attenuation factor of the probe.

This setting remains in effect before you changed again.

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



The probe setting window in the sidebar:

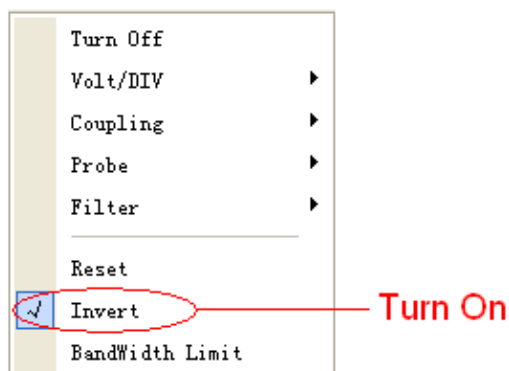


**Caution:** The attenuation factor changes the vertical scale of the oscilloscope so that the measurement results reflect the actual voltage levels at the probe tip.

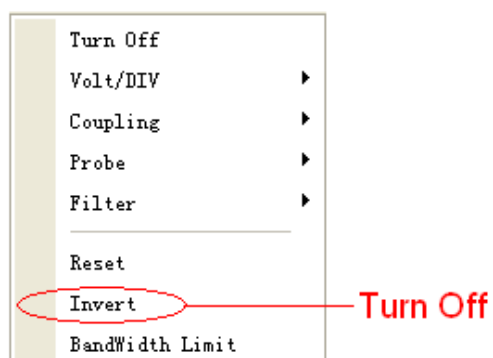
### Invert

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

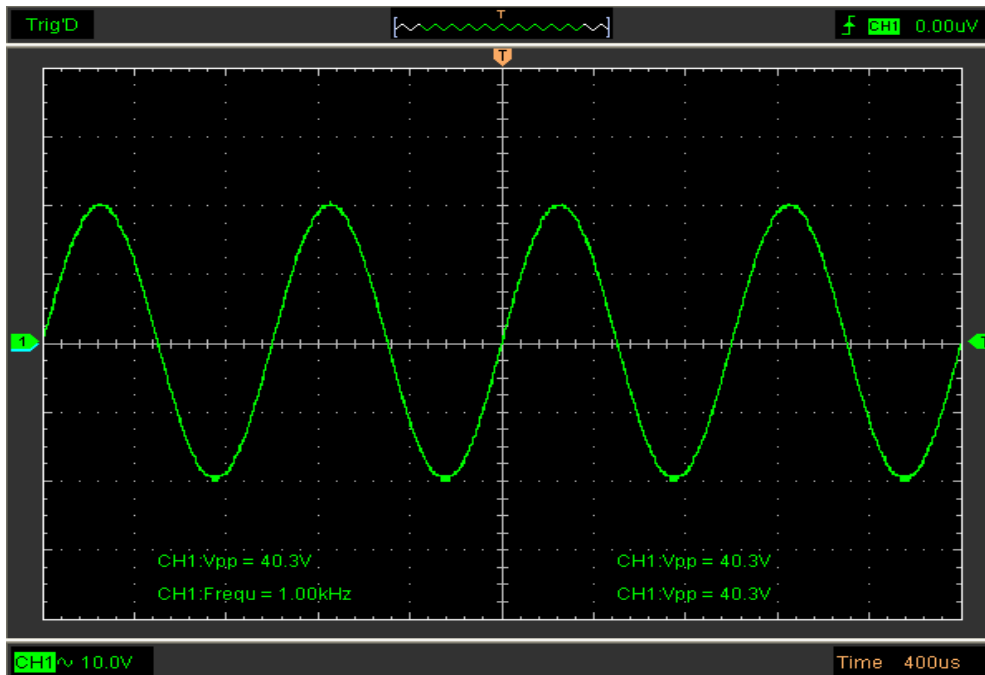
Turn on Invert:



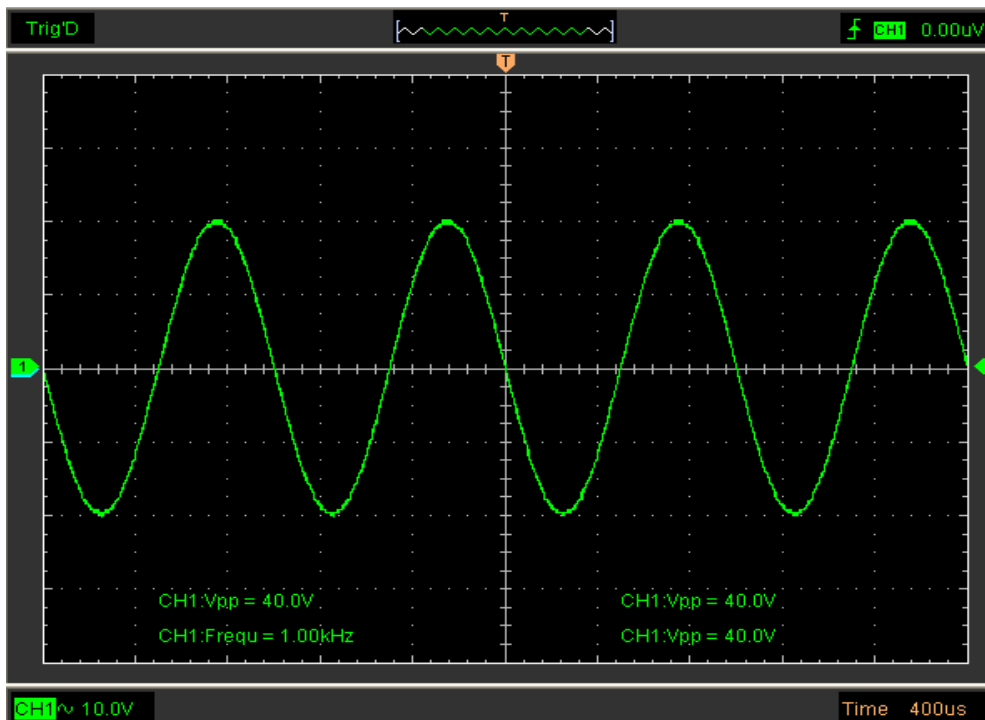
Turn off Invert:



The following picture shows the waveform before inversion:



The following picture shows the waveform of inversion:

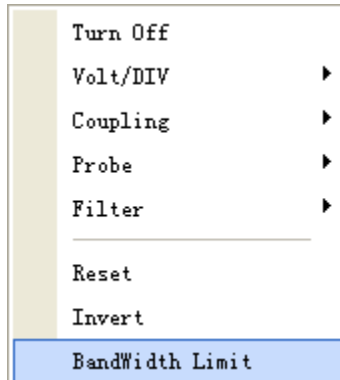


### Set the Channel Bandwidth Limit

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.



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



#### Filter definition:

None: without the Filter, read out the actual value directly.

Lower: with low limitation filter, the waveform will look more thin than in “None” mode.

Higher: with high limitation Filter, the waveform will look more thin than in “Lower” mode.

### 3.2.2 Set Math

Click “**MATH**” in **Channel** menu to set **MATH** channel.

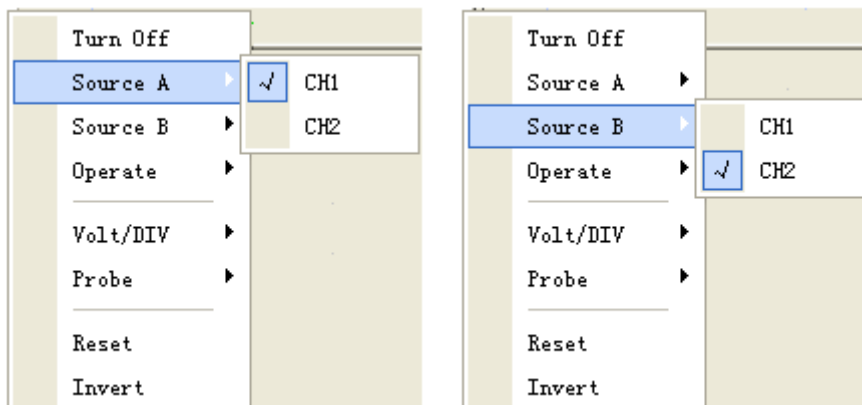
The **MATH** Menu:

- ◆ **Turn On/Off:** Turn On/Off the MATH Channel.
- ◆ **Source A/B:** Set the sources of the math channel.
- ◆ **Operate:** Set operates type of the math channel.
- ◆ **Volt/DIV:** Set the resolution of the math channel.
- ◆ **Probe:** Set the math channel probe attenuation.
- ◆ **Reset:** Set the math channel vertical position to zero.
- ◆ **Invert:** Turn on/off the invert function

The mathematic functions include addition, subtract, multiply and division for CH1 and CH2.

#### Source A/B:

Source A and Source B menu:



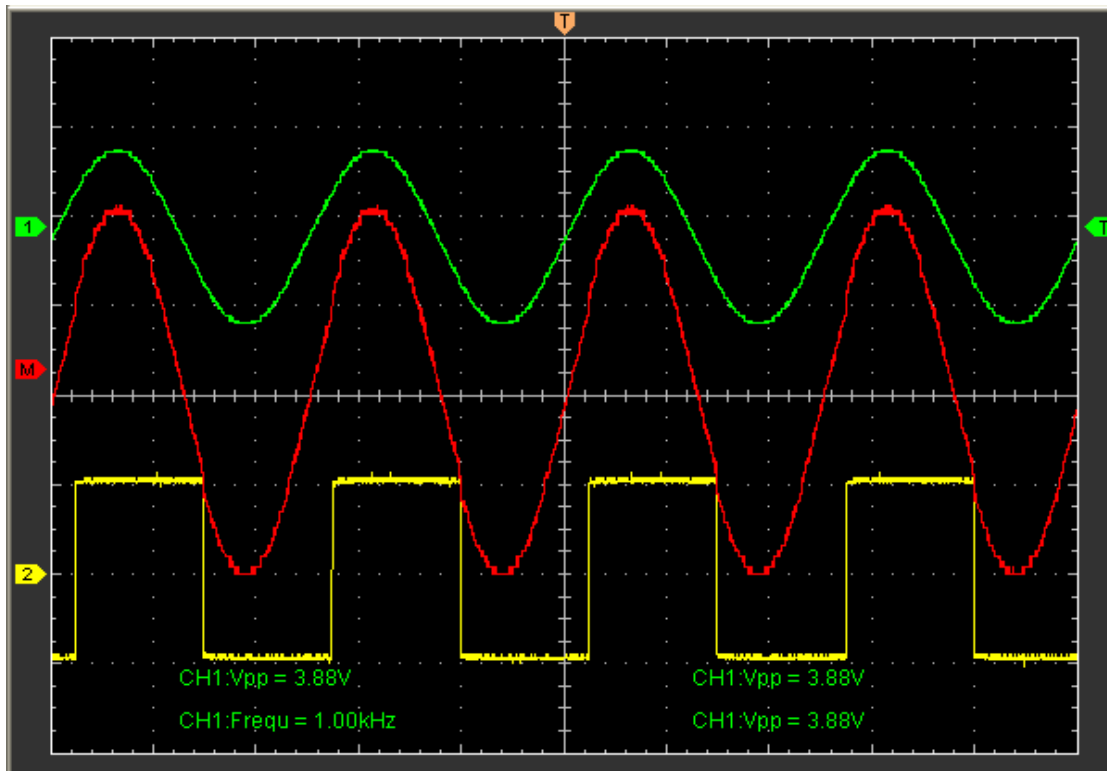
**Operate:**

Four Types:

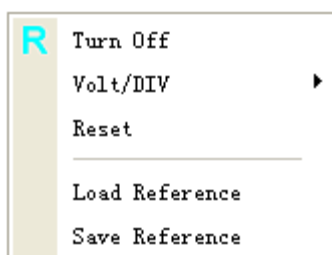
- A + B      Add source A and source B
- A - B      Subtract source B from source A
- A × B      Source A Multiply source B
- A / B      Divided source A by source B

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:****3.3.3 Set Reference**

Click **Reference** in **Channel** menu to set REF channel.



The Reference Channel Function:

**Turn On/Off:** Turn on/off the reference channel.

**Volt/DIV:** Channel the resolution of the reference channel.

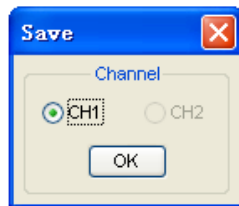
**Reset:** Reset the reference channel vertical position to zero.

**Load Reference:** Load the reference waveform from the “.ref” file from your computer.

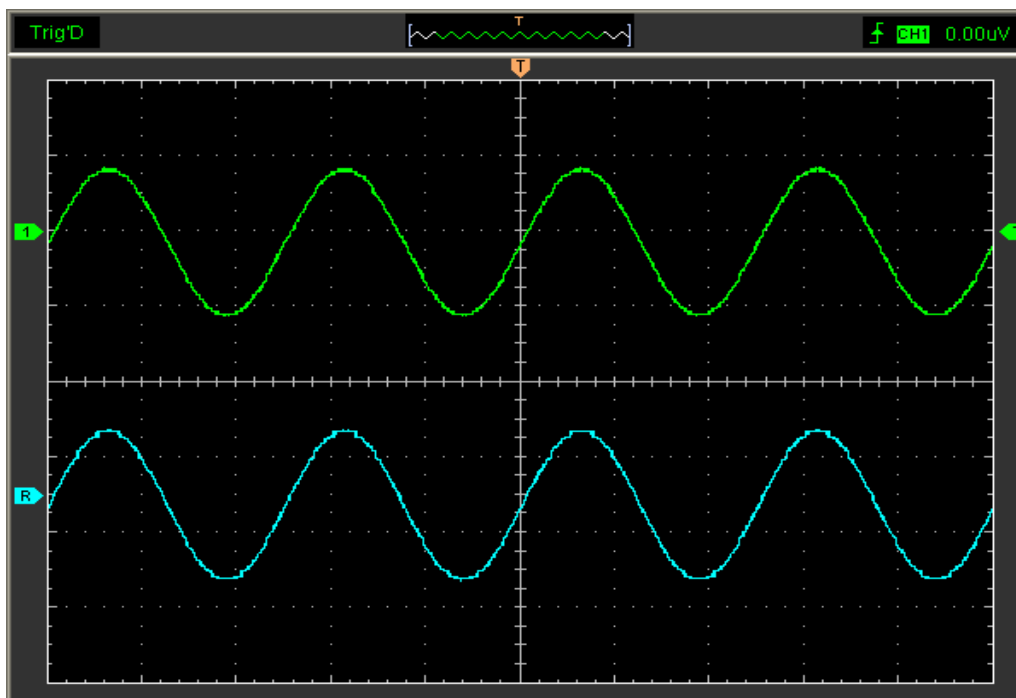
**Save Reference:** Save the current reference waveform to your computer as “.ref” format.

You can change the vertical scale of a waveform. The waveform display will contract or expand relative to the reference level.

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



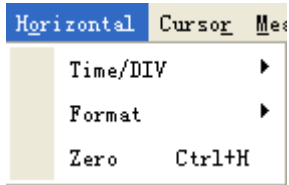
**The Reference Waveform Display Window:**



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

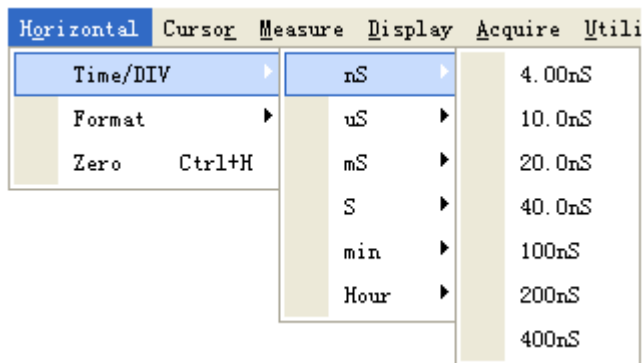
## 3.3 Set Horizontal System

Click “**Horizontal**” in main menu.



### 3.3.1 Change Time/Div

The “Time/Div” Menu:



Select the horizontal **Time/Div** (scale factor) for the main or the window time base.

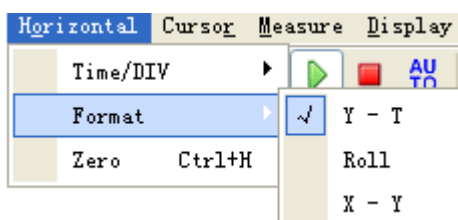
**The Horizontal Panel**



Click the blue knob can change **Time/Div**.

### 3.3.2 Change Format

Click “**Format**” menu.



In the **“Format”** item, set the waveform display format (**Y-T**, **X-Y** and **Roll**).

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

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

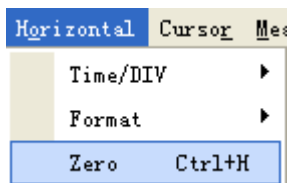
**X -Y:** Show CH1 value at X axis; CH2 value at Y axis.

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

**Caution:** If the time/div bigger than 1s, the format will change to Roll mode automatically.


### 3.3.3 Change Horizontal Position

The **“Zero”** menu:



Click **“Zero”** to set the trigger point to the horizontal center of the screen.

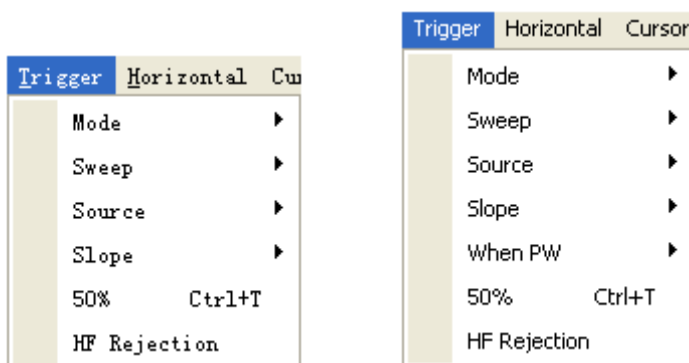
Horizontal position changes the displayed waveform position, relative to the trigger point.

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

## 3.4 Set Trigger System

### 3.4.1 Set Trigger

Click **“Trigger”** in main menu.



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.

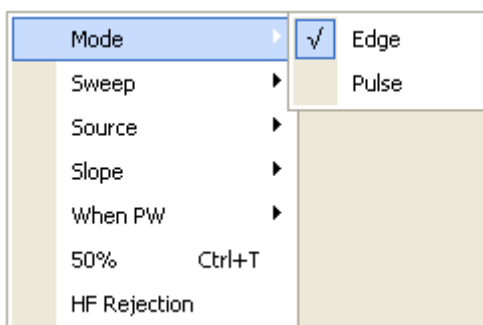
If the oscilloscope wants to acquire a waveform, it collects enough data so that it can draw the

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.

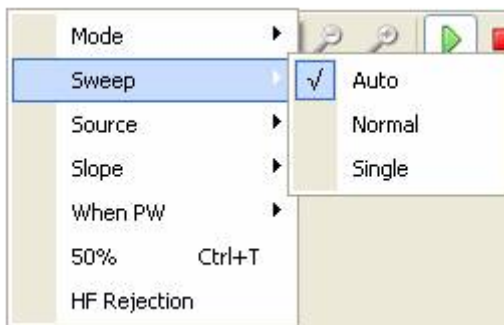
The **Edge** trigger determines whether the oscilloscope finds the trigger point on the rising or the falling edge of a signal. Select **Edge** trigger mode to trigger on **Rising** edge or **Falling** edge.

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

**Mode:** Select the trigger mode.



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

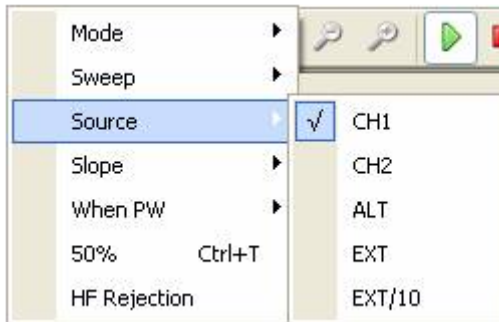


**Auto:** Acquire waveform even no trigger occurred

**Normal:** Acquire waveform when trigger occurred.

**Single:** Acquire waveform when trigger occurred then stop

**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

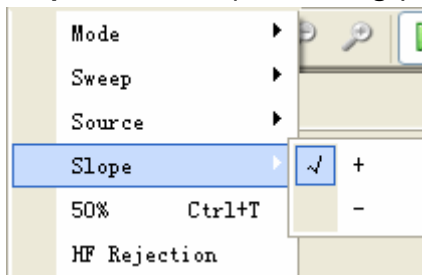
**CH2:** Select CH2 as trigger signal

**ALT:** Select CH1 and CH2 as trigger signal

**EXT.:** Select EXT as trigger signal

**EXT./10:** Select attenuated EXT/10 as trigger signal

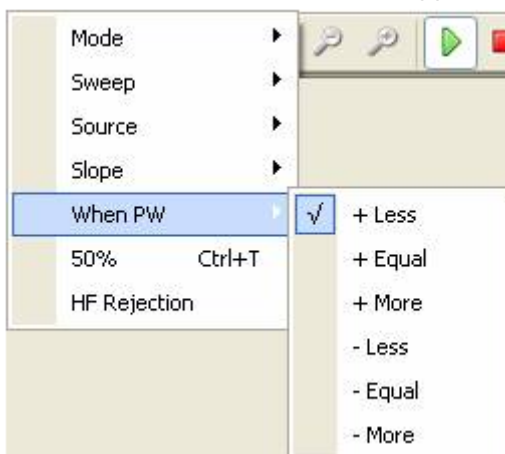
**Slope:** Set the slope to **Rising (+)** or **Falling (-)**.



**Rising:** Trigger on rising edge

**Falling:** Trigger on falling edge

**When PW:** Set the pulse width trigger condition. (**Hantek6212BE**)



**+ Less:** Positive pulse width less than

**+ Equal:** Positive pulse width equal to

**+ More:** Positive pulse width more than

**- Less:** Negative pulse width less than

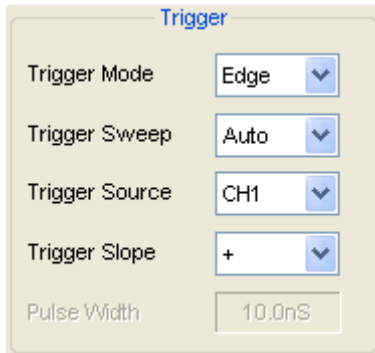
**- Equal:** Negative pulse width equal to

**- More:** Negative pulse width more than

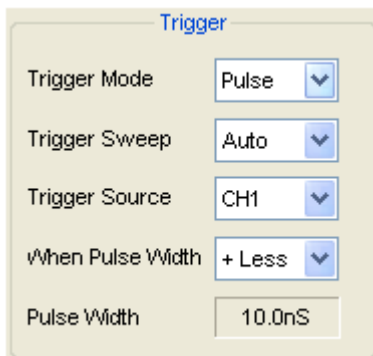
**Note:** There is only **Edge** trigger for Hantek6102BE.

**50%:** Sets the trigger level to the center of the waveform amplitude

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



### Pulse Width Setting

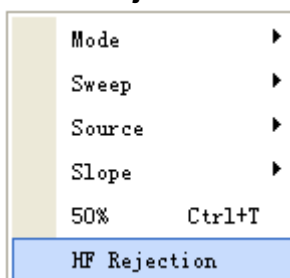


Click the pulse width value to set pulse width. The pulse width value range is 10ns - 10s. When the condition is set, it will trigger and acquire the signals.



### 3.4.2 HF Rejection

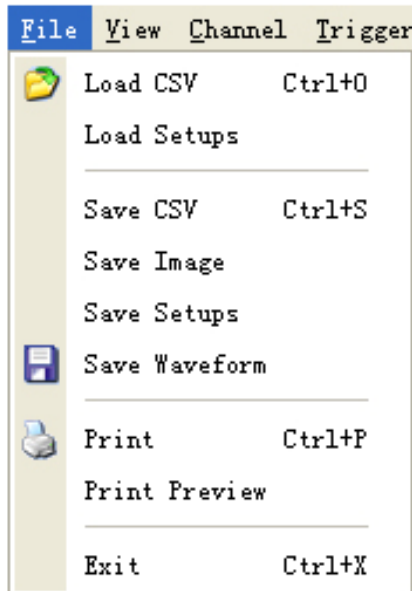
Click "**HF Rejection**" in "**Trigger**" menu:



The user can turn on “**HF Rejection**” to eliminate trigger higher-frequency (20M above).

## 3.5 Save/Load

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



### Save:

#### 1. Save CSV

Save waveform data as a CSV file

#### 2. Save Image

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

#### 3. Save Setups

Save the current oscilloscope setups to file

#### 4. Save Waveform

Save waveform data as a TEST, WORD or EXCEL file.

### Load:

#### 1. Load CSV

Load the waveform that had saved as a CSV file

#### 2. Load Setups

Load the instrument that had saved

## 3.6 Utility Function

Click the “**Menu -> Utility**” to get into the “**Utility**” menu.



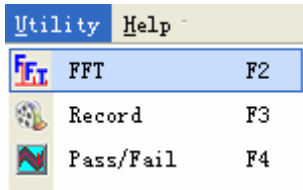
The “**Utility**” Functions:

- ◆ **FFT**
- ◆ **Record**
- ◆ **Pass/Fail**
- ◆ **Calibration(See Self Calibration)**
- ◆ **Factory Setup**
- ◆ **Language**

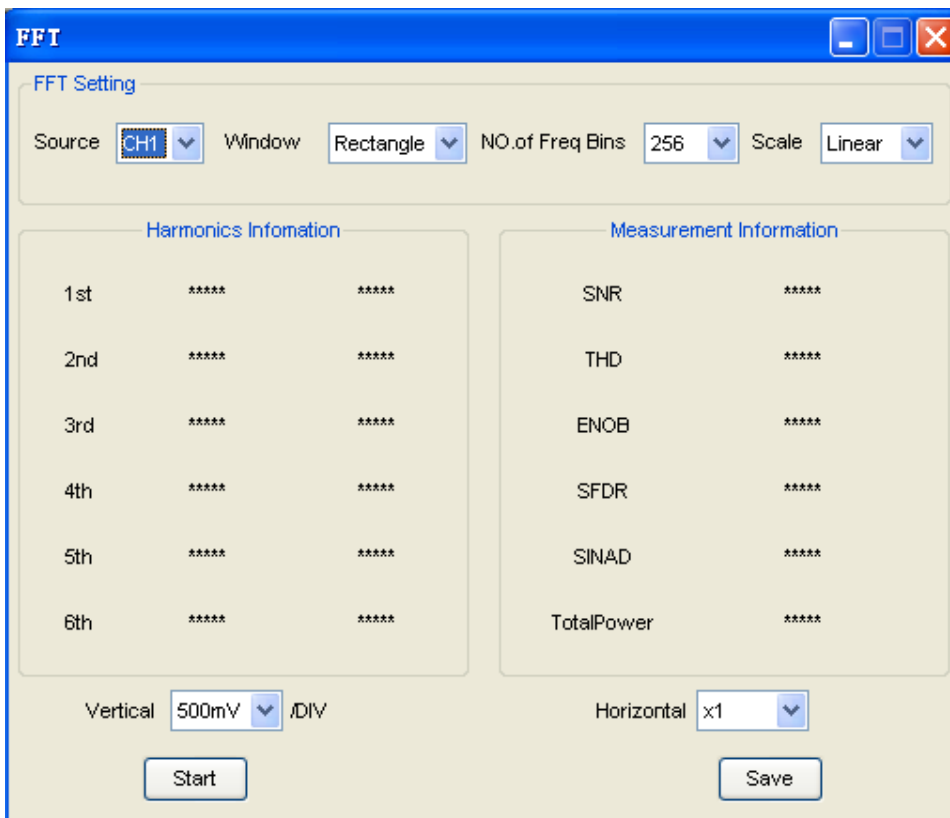
### 3.6.1 Fast Fourier Transform Function

You 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 “**Menu->Utility->FFT**” to open the FFT setup window.



The FFT setup window:



You can select the Source channel, Window algorithm, FFT number, and FFT Zoom factor. It displays only one FFT spectrum at a time.

**Source:** Source CH1

Selects the channel used as the FFT source

**Window:** Window Rectangle

Selects the FFT window type

The windows reduce spectral leakage in the FFT spectrum.

**No. of Freq Bins:** NO.of Freq Bins 256

Selects the FFT number

**Scale:** Scale Linear ▾

Selects the vertical scale units

**Vertical:** Vertical 500mV ▾ /DIV

Selects the vertical scale

**Horizontal:** Horizontal x1 ▾

Selects the FFT zoom factor

Sets horizontal scale, If the information is more than the quantity displayed to the display window, more information is displayed by using scroll bar.

You can click the “Start” button to start FFT math, also you can click this button to stop FFT math.

Click “Save” button if you want to save FFT math result. You can save the data into Word file, Excel file or Text file.

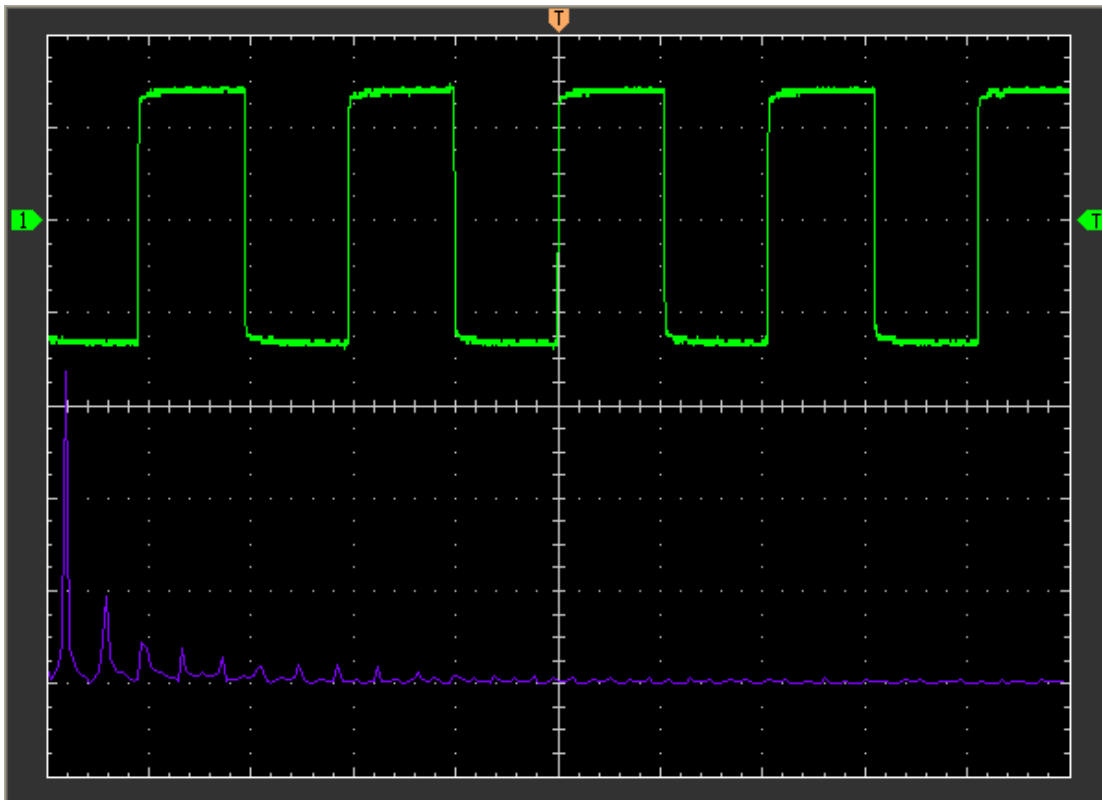
**Harmonic** information window shows the information of Harmonics.

1st	50.0kHz	1.20V
2nd	100kHz	707mV
3rd	150kHz	58.8mV
4th	200kHz	235mV
5th	250kHz	308mV
6th	300kHz	57.0mV

**Measurement** information window shows the information about measurement of FFT.

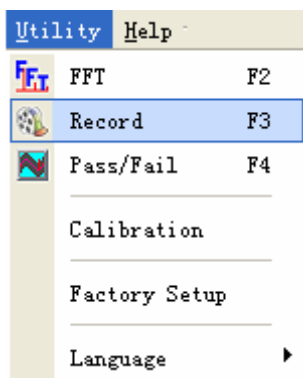
SNR	-0.144dB
THD	-3.391dB
ENOB	-0.316bits
SFDR	4.562dB
SINAD	-1.678dB
TotalPower	5.505dB

### The FFT display Windows:



### 3.6.2 Record and Play Back

Click **Record** in **Utility** menu.

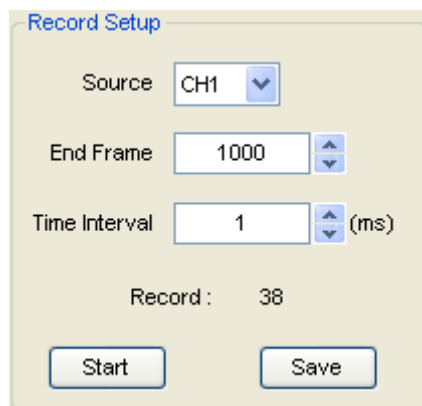


The **Record** window will display. The following picture shows the **Record** Interface.



This function can record input waveform form CH1 or CH2. The maximum record length is **1000** frames.

#### Record Setup window:



**Source:** Source CH1

Select record source channel. (CH1 or CH2)

**End Frame:** End Frame 1000

Set the number of record times. The max frames are **1000**.

**Time Interval:** Time Interval 1 (ms)

Set the time interval of record waveform.

**Record:** Record : 38

Record counter, it shows the record frames.

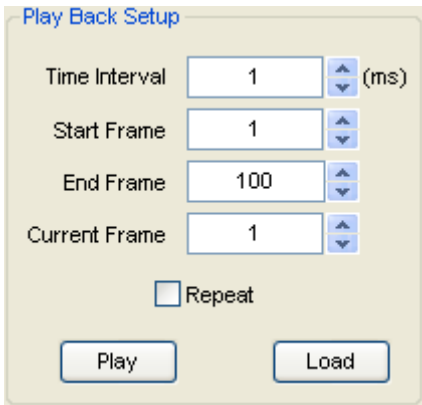
**“Start”** button: 

Start to record frames. After you start to record waveforms, this button changes to **“Stop”** button. It stops recording waveforms.

**“Save”** button: 

Save the record setup to file.

### Play back setup window



Play Back Setup

Time Interval  (ms)

Start Frame

End Frame

Current Frame

Repeat

**Time Interval:**  (ms)

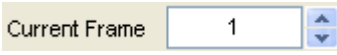
Set the time interval of play back.

**Start Frame:** 

Set the start frame of play back.

**End Frame:** 

Set the end frame of play back.

**Current Frame:** 

Displays the current frame of play back. You can also change this number to watch the waveform one by one.

**Repeat:**  Repeat

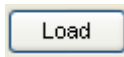
If it was checked, the waveform will be played back repeatedly.

**“Play”** button: 

Click this button to start playing back waveform. It can stop playing back if you started

playing back.

“Load” button:

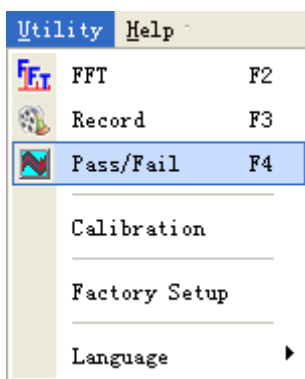


Click this button to load a record setup.

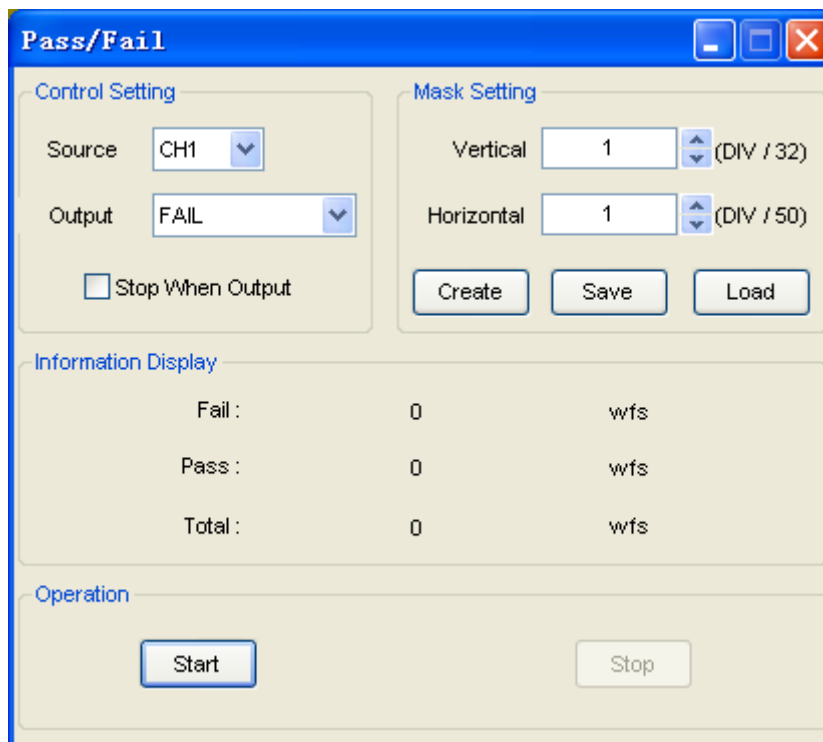
**Note:** When it plays back waveform, the other channel will be turned off.

### 3.6.3 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:** Source CH1

Select the **Pass/Fail** channel

**Output:** Output FAIL

Select the **Pass/Fail** output condition

**Stop When Output:**  Stop When Output

If it was checked, the **Pass/Fail** will stop when output.

## Mask Setting

**Vertical:** Vertical 8 (DIV / 32)

Set the vertical limit range

**Horizontal:** Horizontal 10 (DIV / 50)

Set the horizontal limit range

**“Create”** button: Create

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

**“Save”** button: Save

Click this button to save the setups to file.

**“Load”** button: Load

Click this button to load the saved setups file.

## Information Display

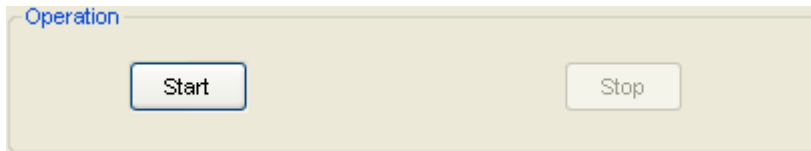
Information Display		
Fail :	0	wfs
Pass :	0	wfs
Total :	0	wfs

Fail: Displays the fail waveform number

Pass: Displays the pass waveform number

Total: Displays the total **Pass/Fail** waveform number

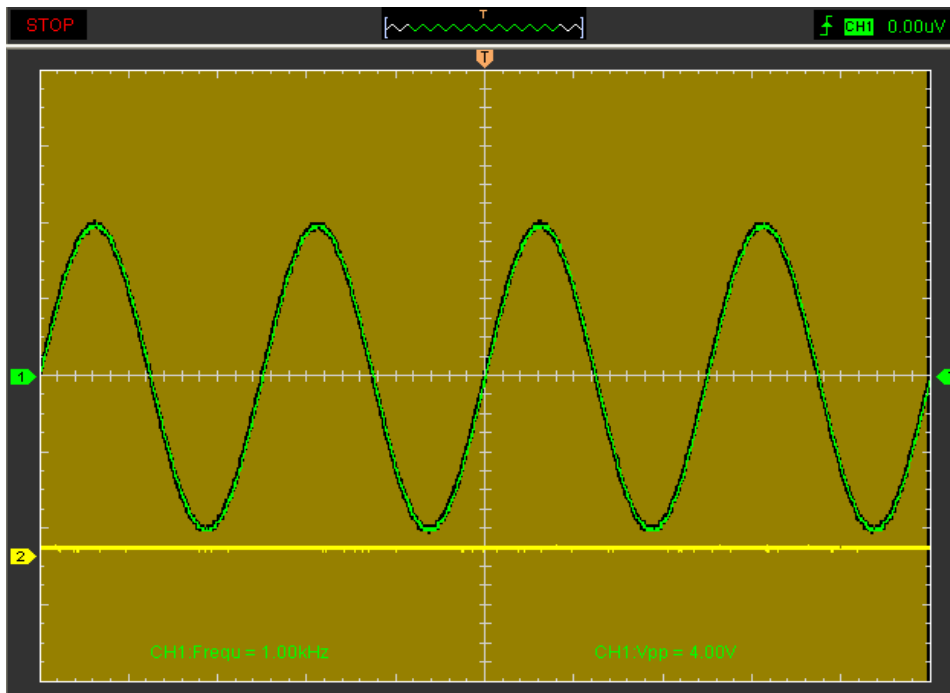
## Operation



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

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

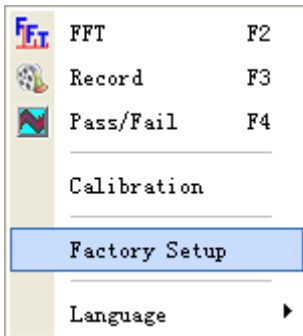
## The Pass/Fail function display:



**NOTE:** **Pass/Fail** function is unavailable in **X-Y** mode and **Roll** mode.

### 3.6.4 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 and CH2 waveforms and removes all other waveforms.

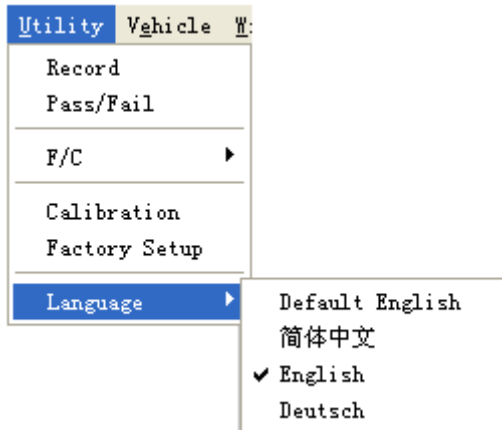
The oscilloscope set up for normal operation when it is shipped from the factory and can be recalled at anytime by user.

The Factory Setup function does not reset the following settings:

- ◆ Language option
- ◆ Date and time

### 3.6.5 Language

Click “**Language**” in “**Utility**” menu.

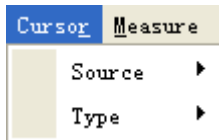


There are four languages in “**Language**” menu. The default language is English.

## 3.7 Measure Signal

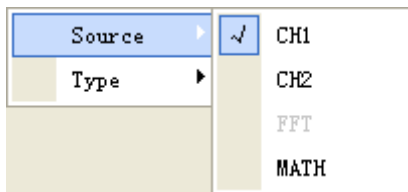
### 3.7.1 Cursor

Click “**Cursor**” in main menu.



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

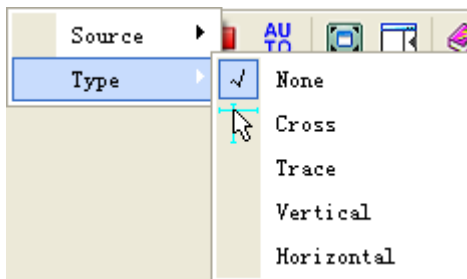
#### 1. Source



The user can set the source to **CH1**, **CH2**, **FFT** and **MATH**. But the **FFT** source can only use **Trace** type.

When you use cursors, be sure to set the **Source** to the waveform on the display that you want to measure.

#### 2. Type

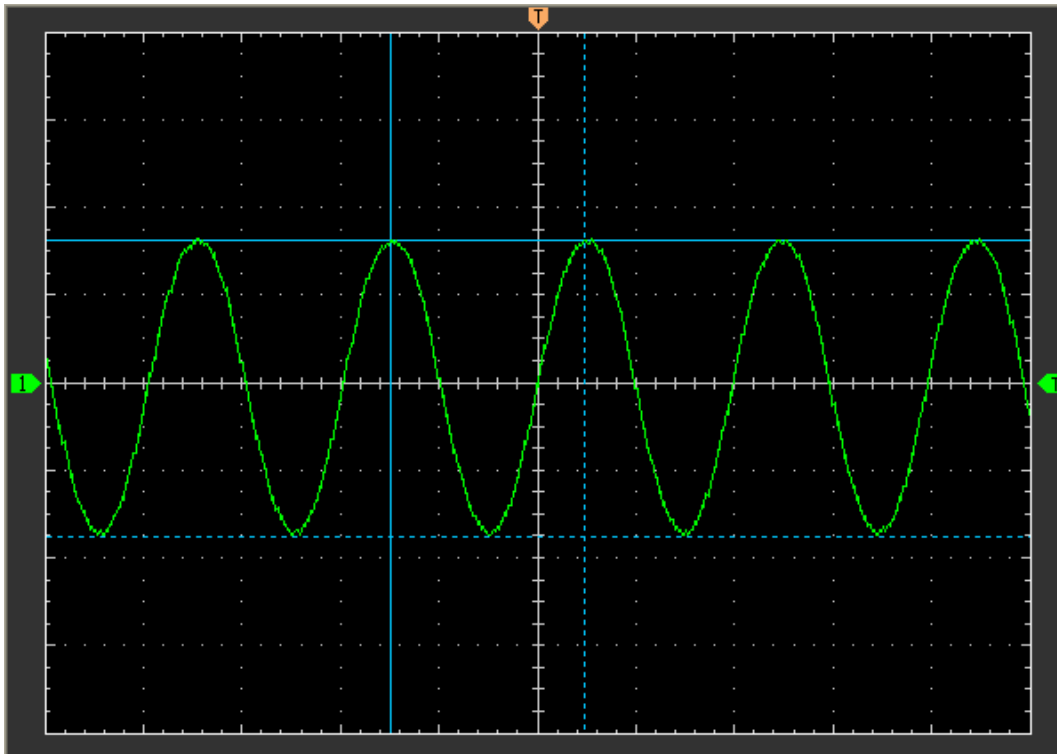


There are four types of cursors: **Cross**, **Trace**, **Vertical** and **Horizontal**.

##### 1) Cross

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

The **Cross** cursor display window:



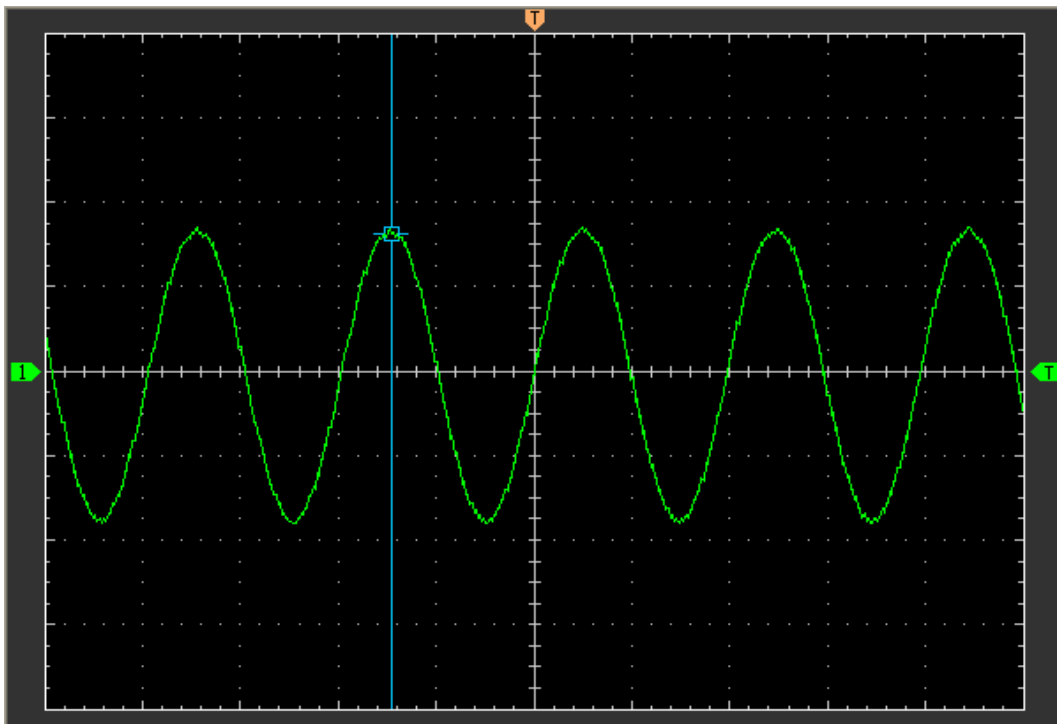
The **Cross** measure result displays on status bar

Freq = 12.683 KHz    Time = 78.843 uS    Volt = 3.403 V

## 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:



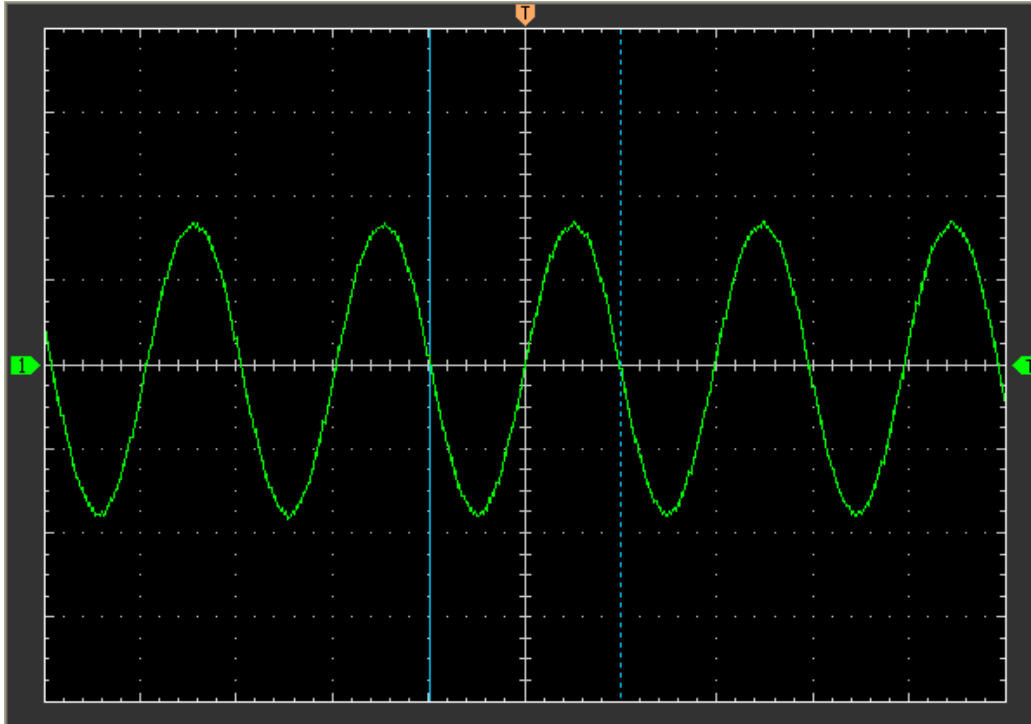
The **Trace** cursor measure result display on status bar

Volt = 1.656 V

### 3) Vertical

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

The **Vertical** cursor display window:



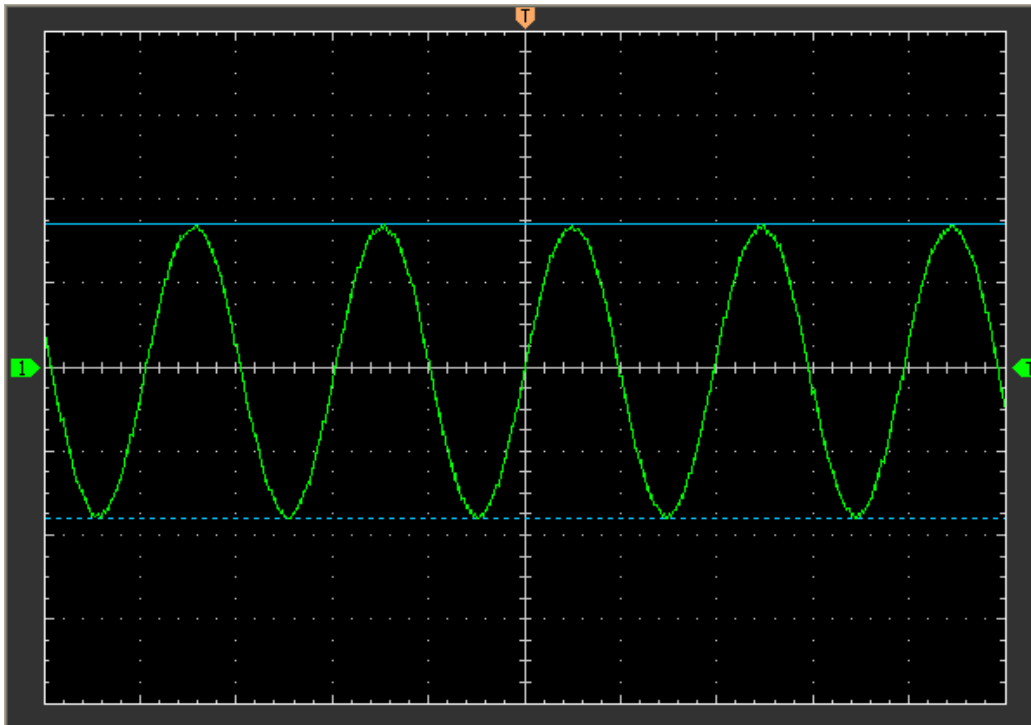
The **Vertical** cursor measure result display on status bar:

Freq = 12.568 KHz    Time = 79.566  $\mu$ S

### 4) Horizontal

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

The **Horizontal** cursor display window:



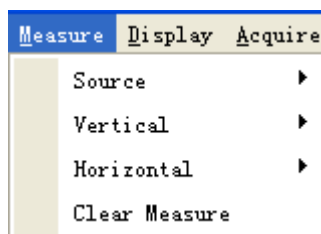
The **Horizontal** cursor measure result display on status bar:

Volt = 3.502 V

### 3.7.2 Measure Menu

Click “**Measure**” in main menu.

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

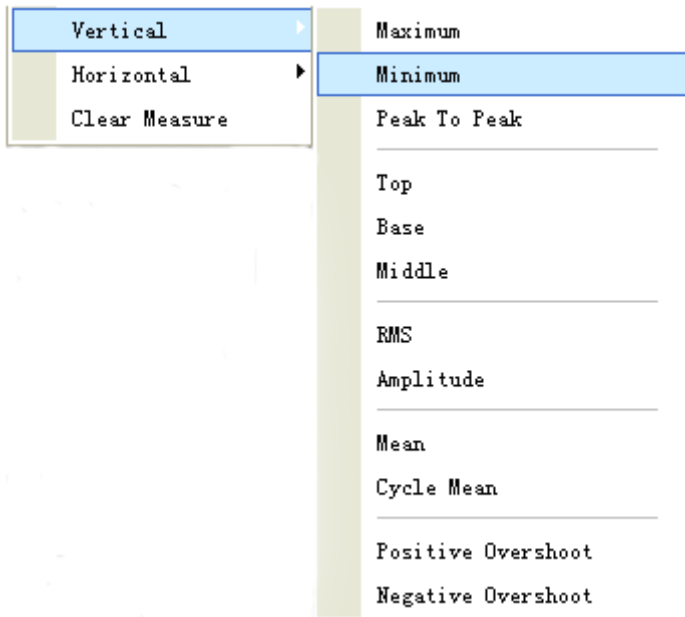


#### 1. Source



The user can use the “**Source**” menu to select a measure 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 maximum 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

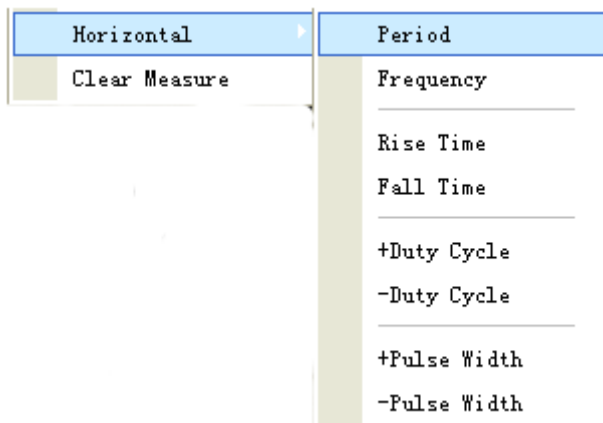
**Amplitude:** Amp=Base-Top, measured over the entire waveform

**Mean:** The arithmetic mean over the entire waveform

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

**Preshoot:** Positive Overshoot  $= (\text{Max}-\text{Top})/\text{Amp} \times 100\%$ , measured over the entire waveform

## 3. Horizontal



**Period:** Time to take for the 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 the waveform

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

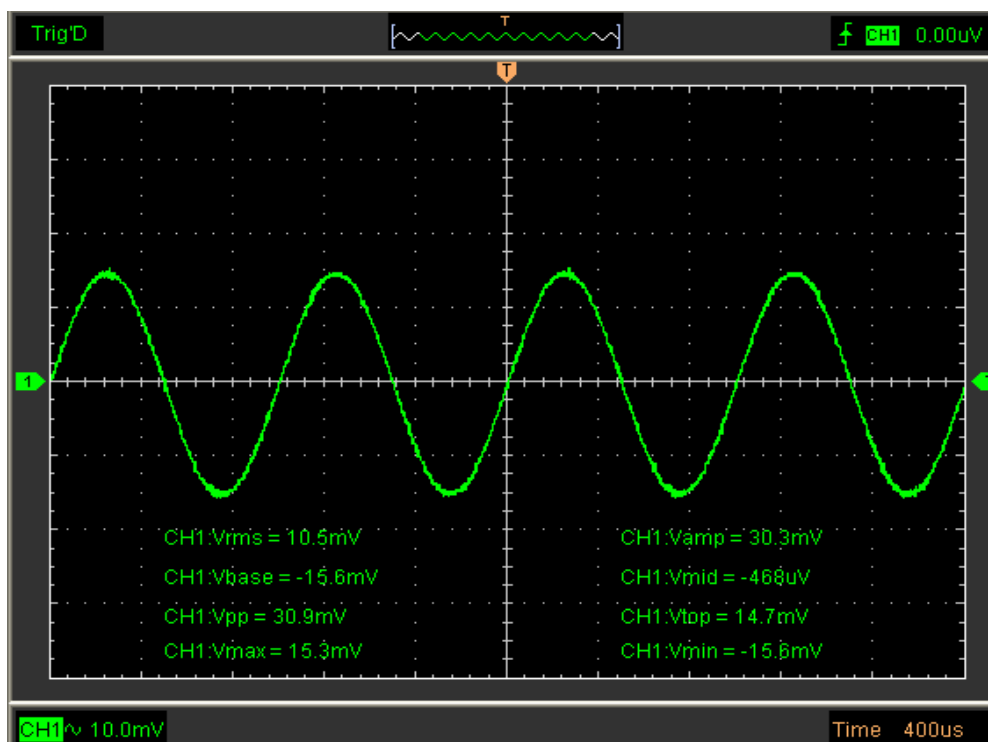
**+Pulse Width:** Measured of the first positive pulse in the waveform. The time between the 50% amplitude points

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

#### 4. Clear Measure

Clear all measure items on display screen.

The **Measure** Display Window:



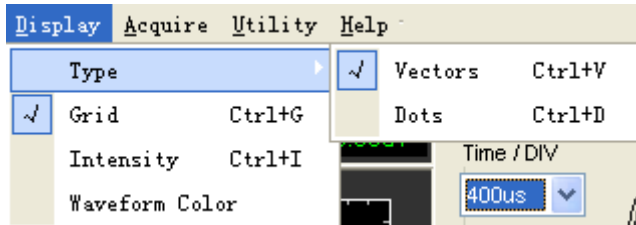
**Caution:** The results of the automatic measurements will be displayed on the bottom of the screen. Maximum 8 results could be displayed at the same time. When there is no room, the next new measurement result will make the previous results moving left, out of screen.

## 3.8 The Display System

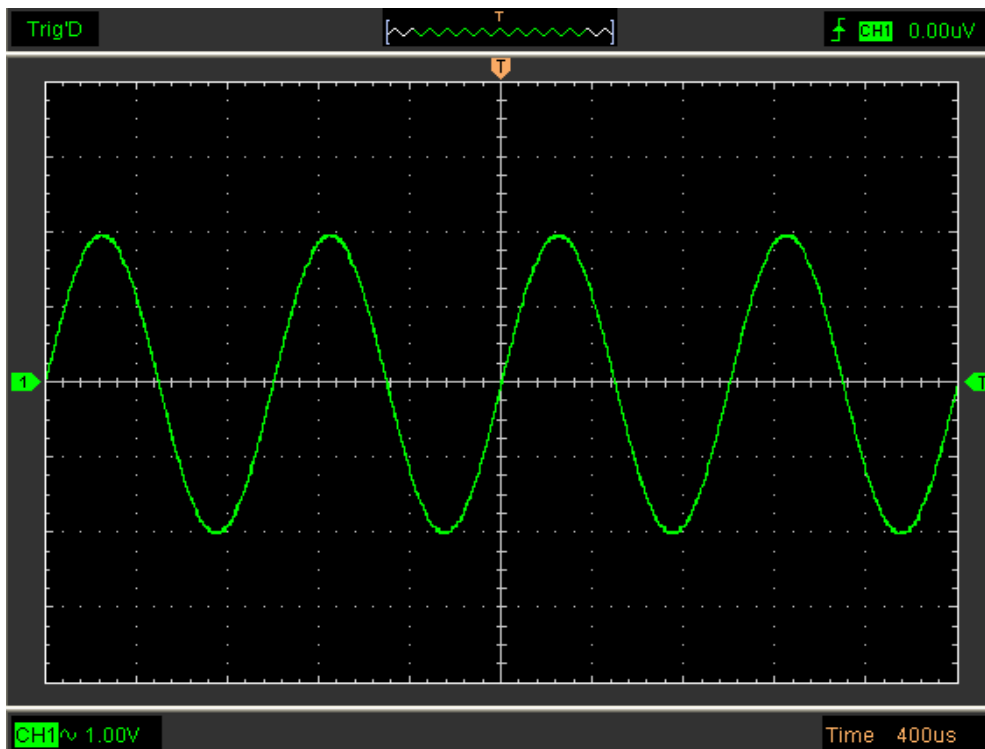
### 3.8.1 Display Type

Click “Type” in “Display” menu.

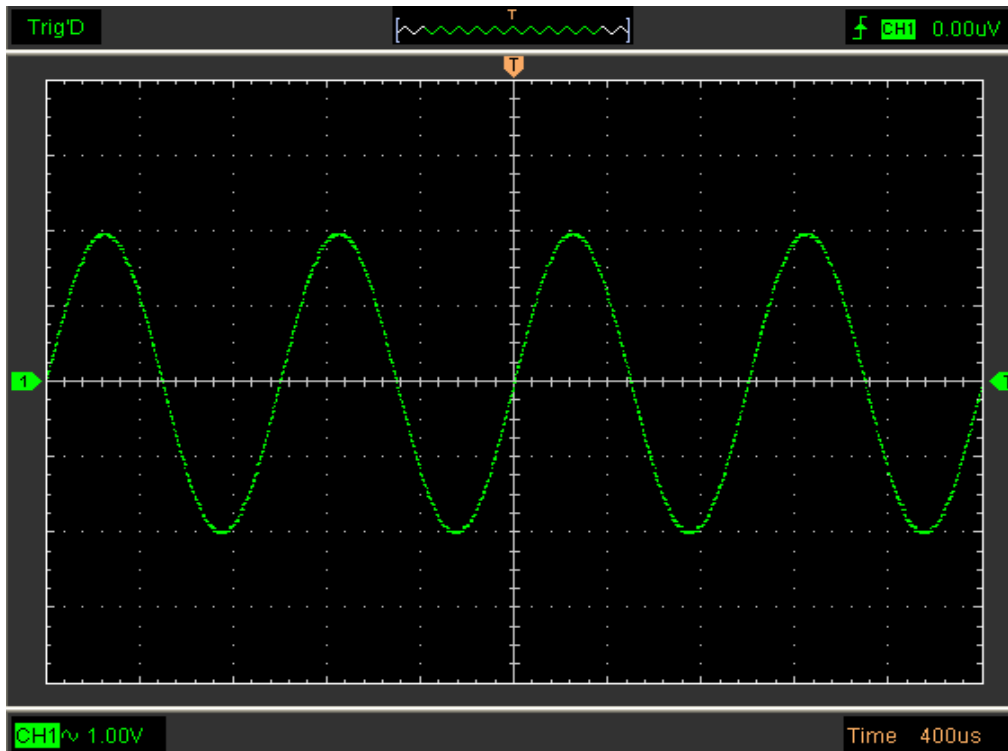
The following figure shows the parameters setting.



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

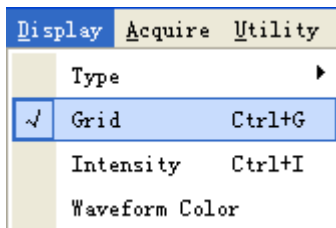


If the **Dots** type mode is selected, the waveform will be displayed as following figure.

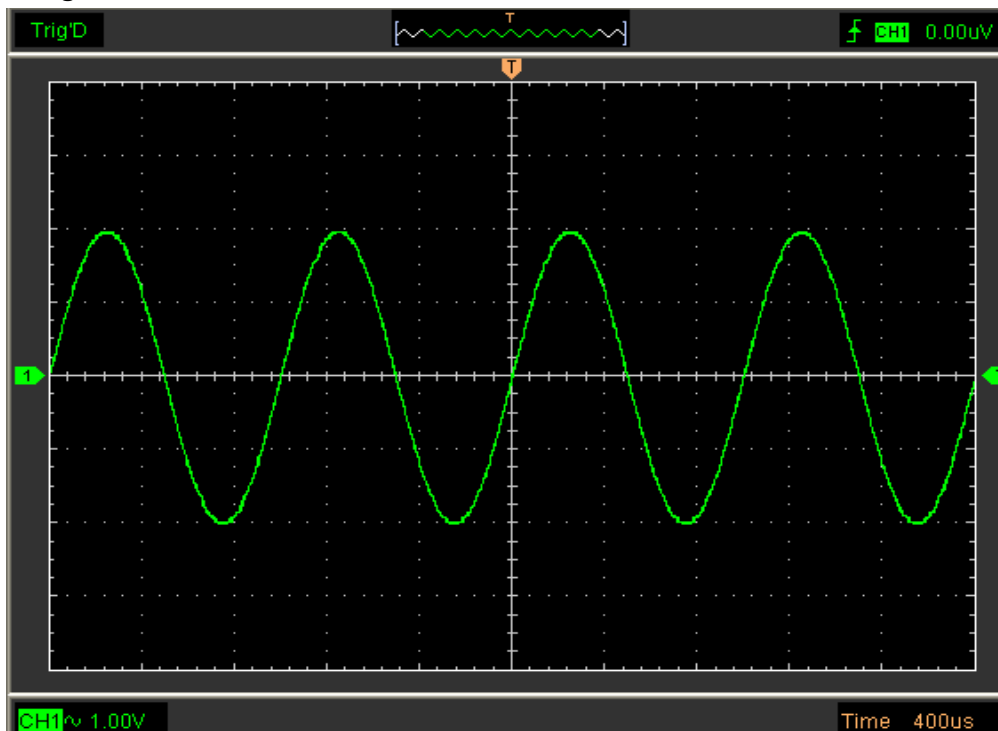


### 3.8.2 Display Grid

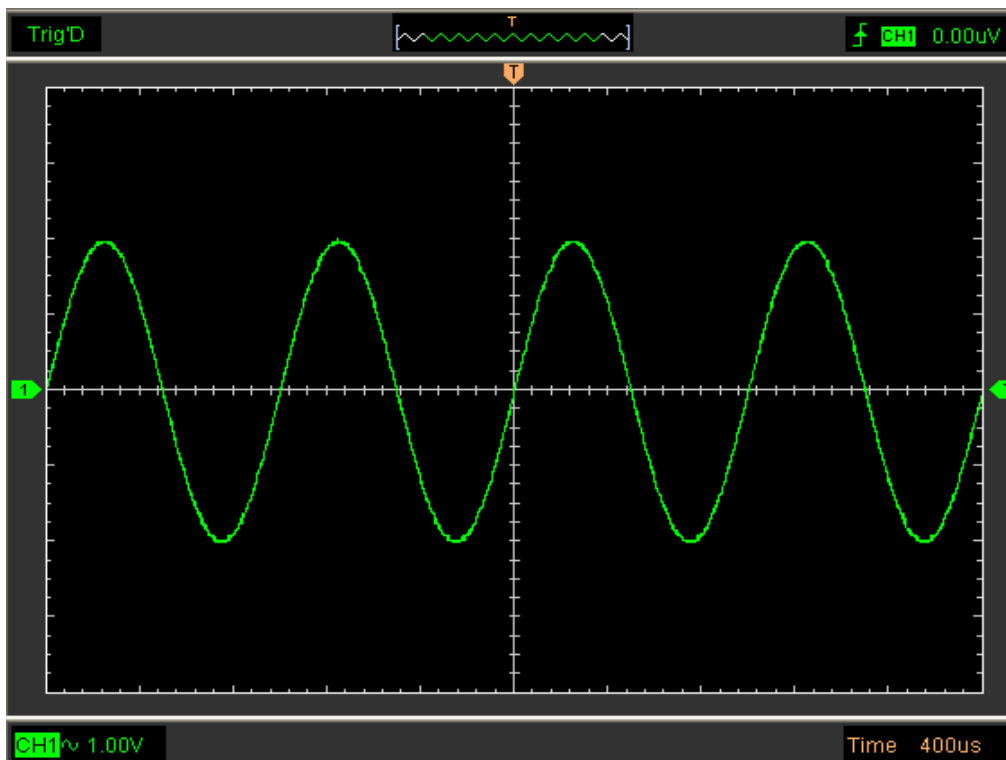
Click “Display” in main menu.



The grid shows:



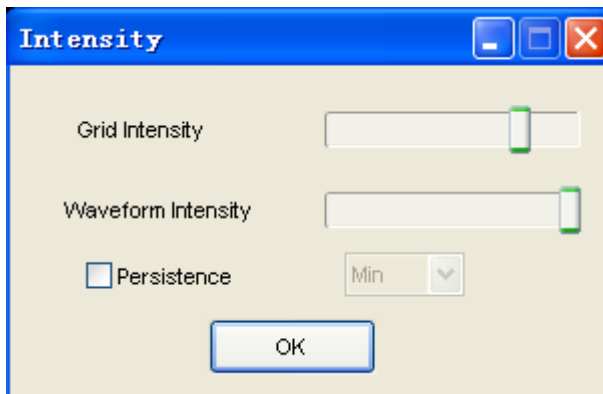
Without the grid shows:



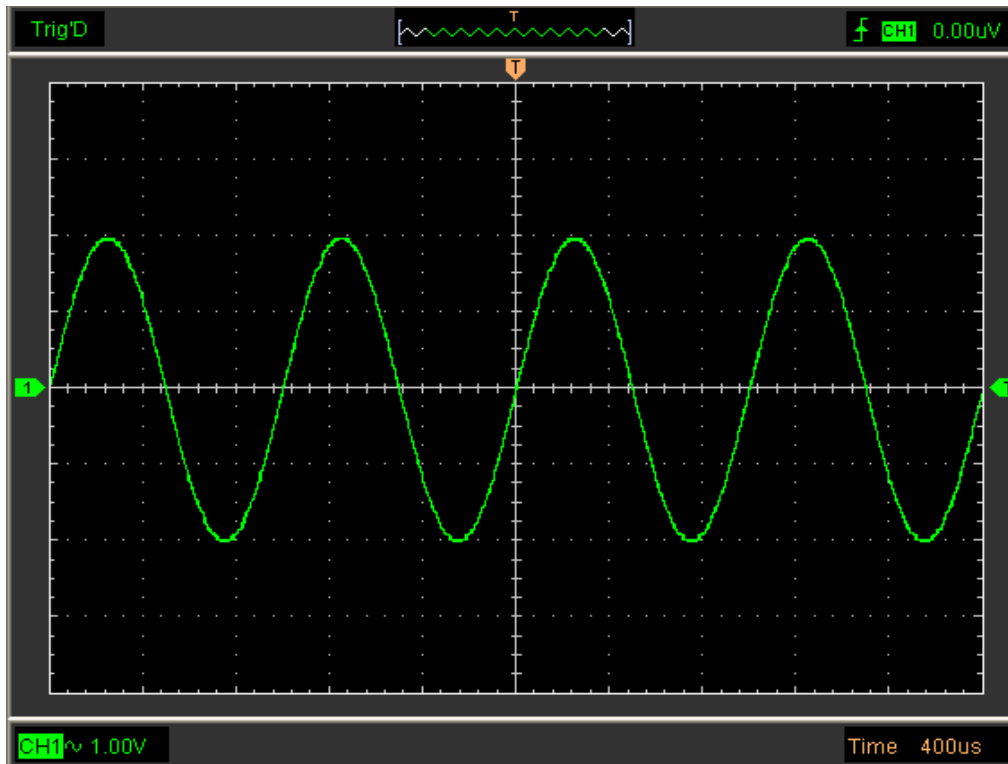
### 3.8.3 Intensity and Persistence

Click “**Display->Intensity**” In main menu

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

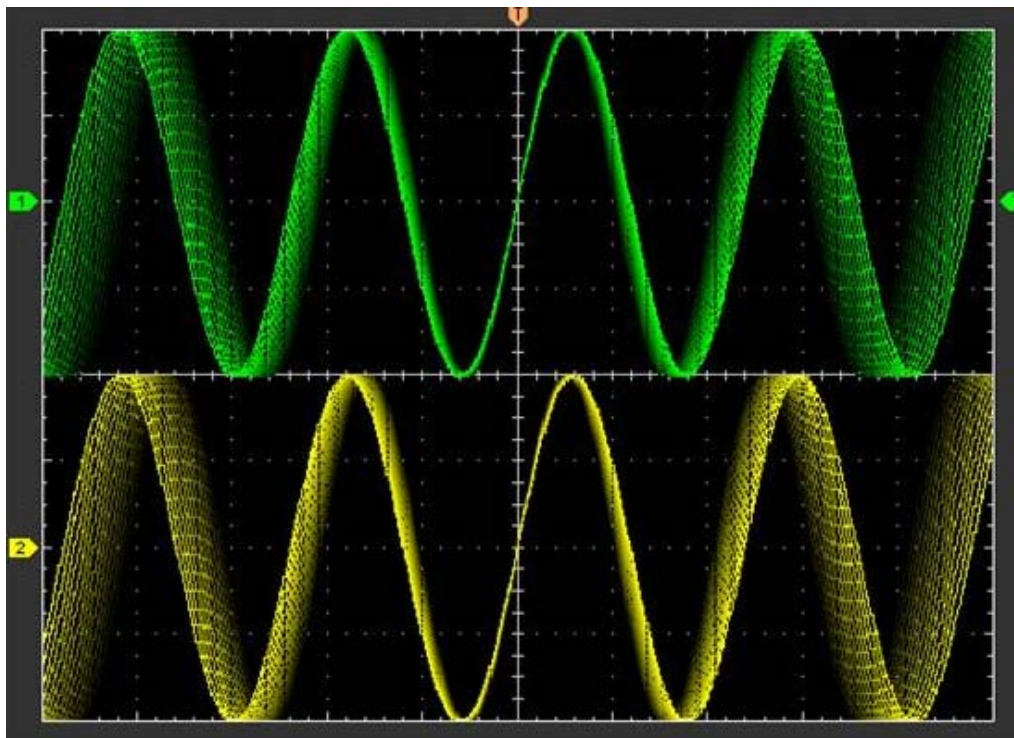


You can change the grid and waveform color intensity in this dialog.



If you check “**Persistence**” and set persistence time:

For example:



### 3.8.4 Waveform Color

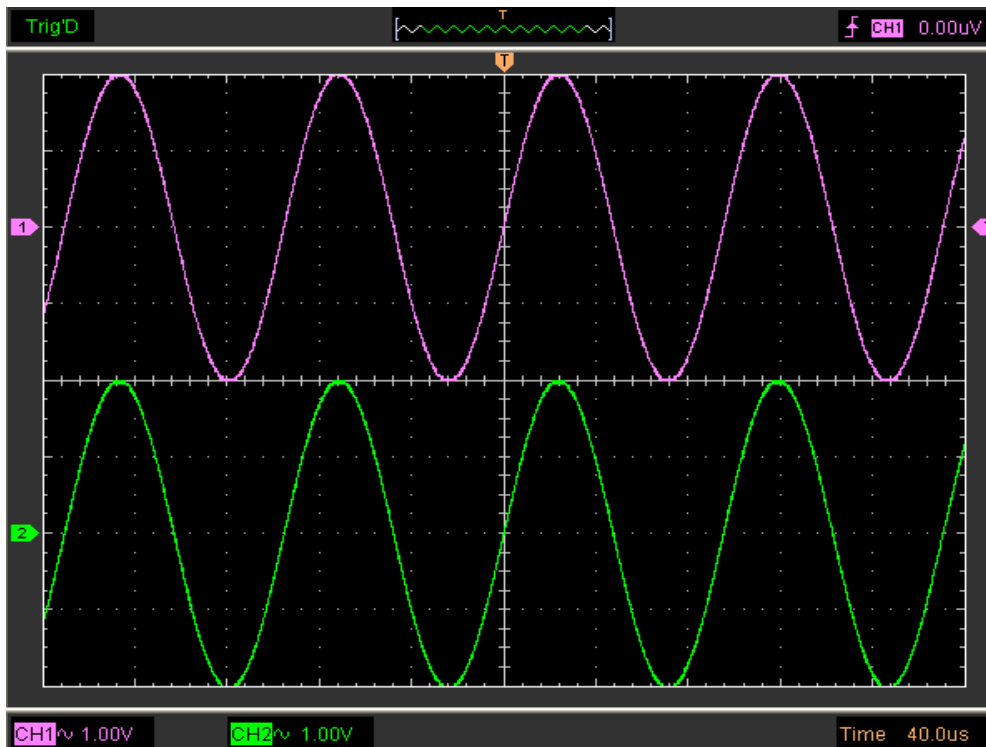
Click “**Display->Waveform Color**” in main menu.

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



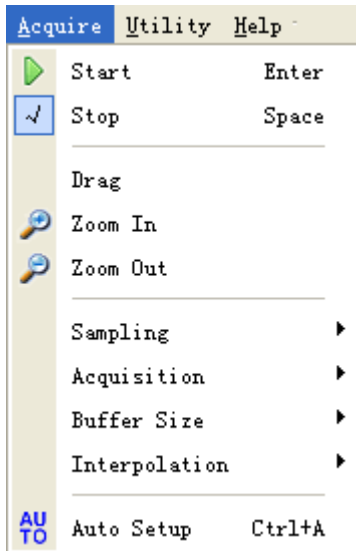
If you click the color rectangle, the color dialog will be showed.

The waveform color was changed:



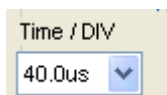
## 3.9 Zoom In/Out and Drag Waveforms

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. When you change the position, the waveform will move up, down, right, or left.



### Zoom In/Out

The user can click “**Zoom In/Out**” in Acquire menu, then left or right 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.



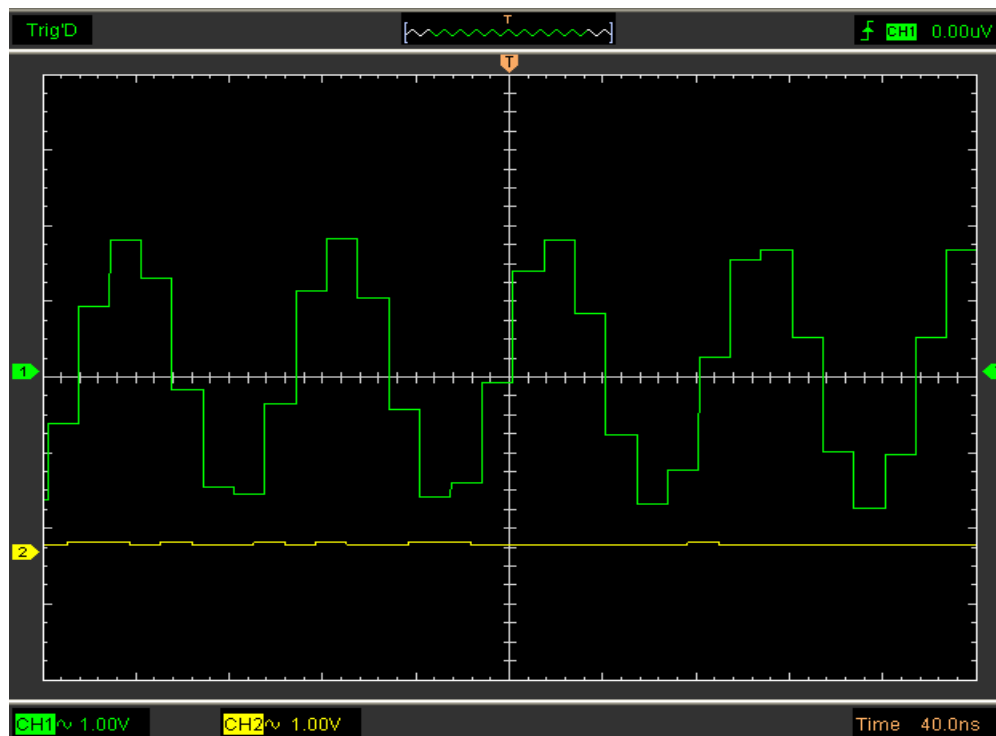
### Drag

The user can modify the waveform position after clicked “**Drag**” in “**Acquire**” menu following the following steps.

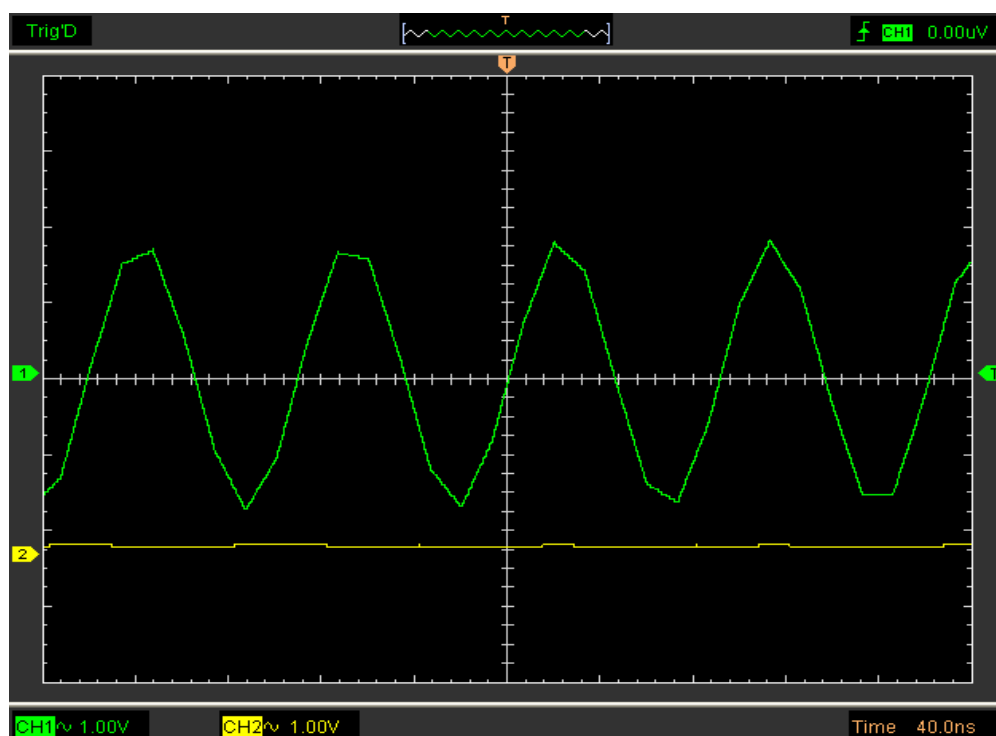
### 3.10 Interpolation

At the time 40ns/div or faster, user can use the different interpolation mode to get waveforms of different smoothness.

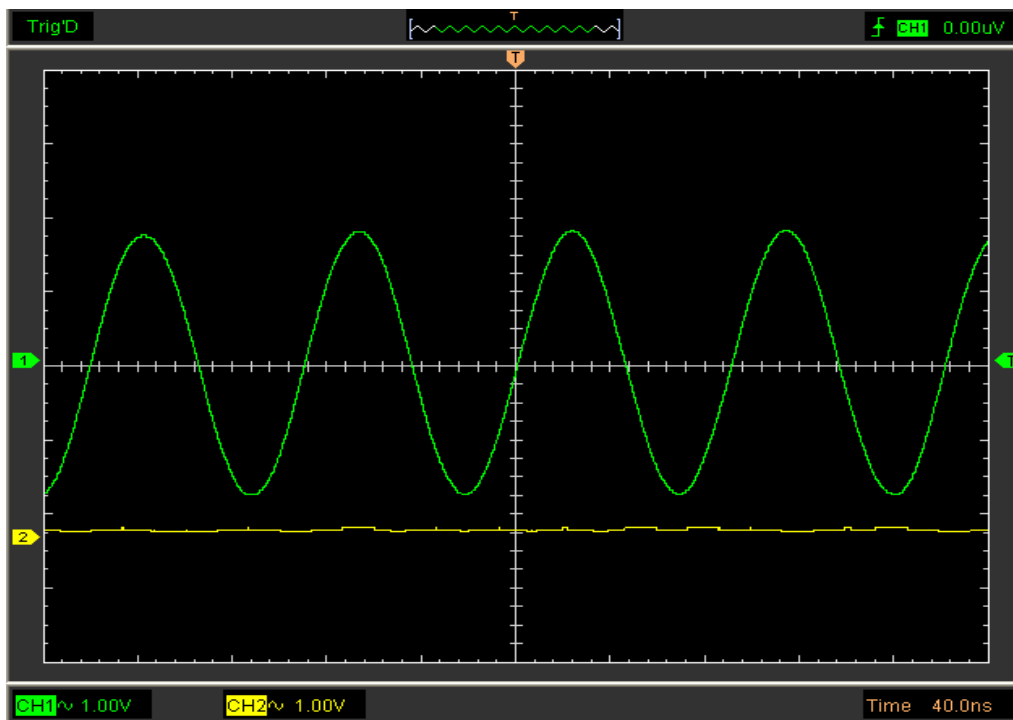
The **Step** Interpolation:



The **Linear** Interpolation:



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



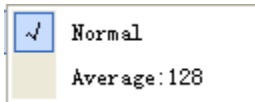
**Caution:** The default interpolation mode is **Sin(x)/x**.

## 3.11 Acquisition Modes

### Acquisition

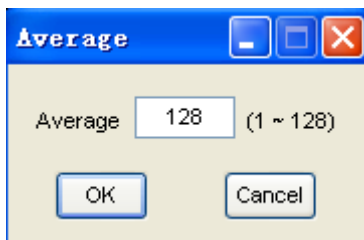
When you acquire a signal, the oscilloscope converts it into a digital form and displays a waveform. The acquisition mode defines how the signal is digitized and the time base setting affects the time span and level of detail in the acquisition.

There are two acquisition modes: **Normal** and **Average**.



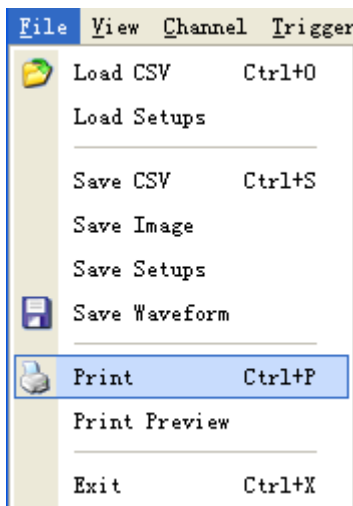
**Normal:** In this acquisition mode, the oscilloscope samples the signal in evenly spaced intervals to construct waveform.

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



## 3.12 Print And Print Preview

Click **Print** in **File** menu to set the printer to print the current waveform.



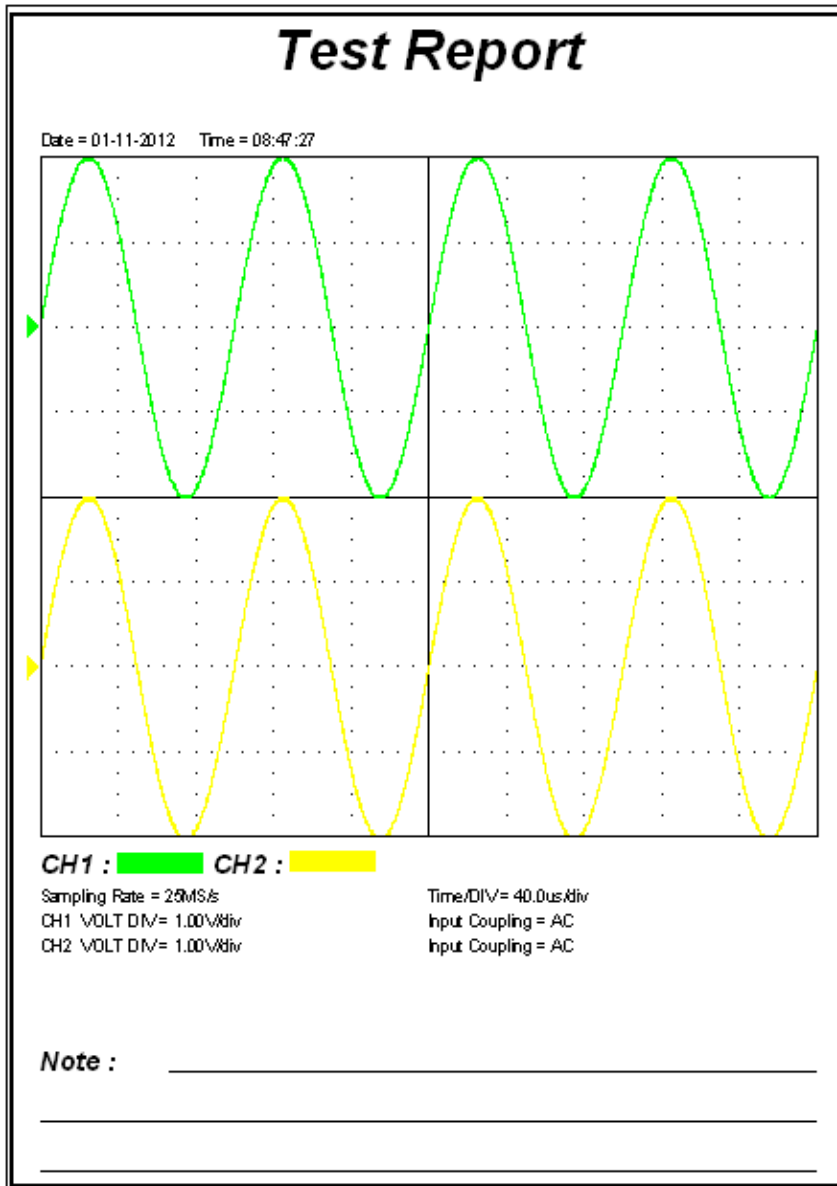
1. Click **print** in **File** menu to set the current waveform.

2. Click the **“Print Preview”** in **“File”** menu to get into the Preview windows.

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.

**The Print report:**



# Chapter 4 Application Example

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



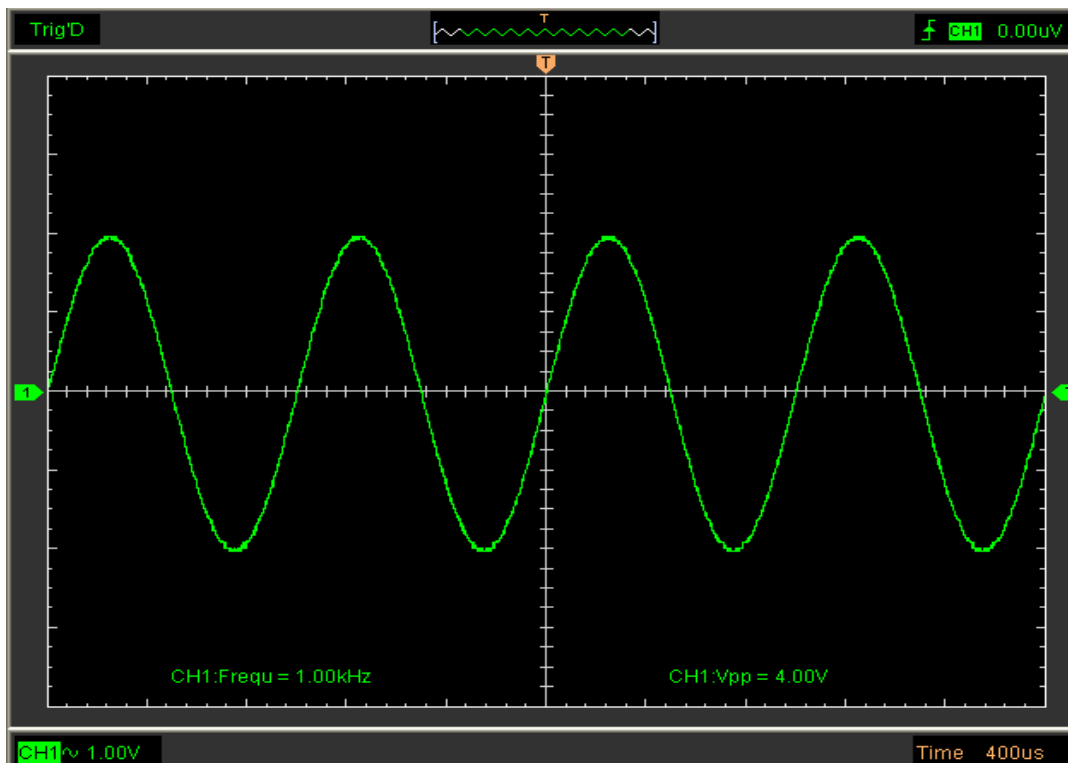
## 4.1 Simple Measurement

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”** -> **“Auto Setup”** on menu.

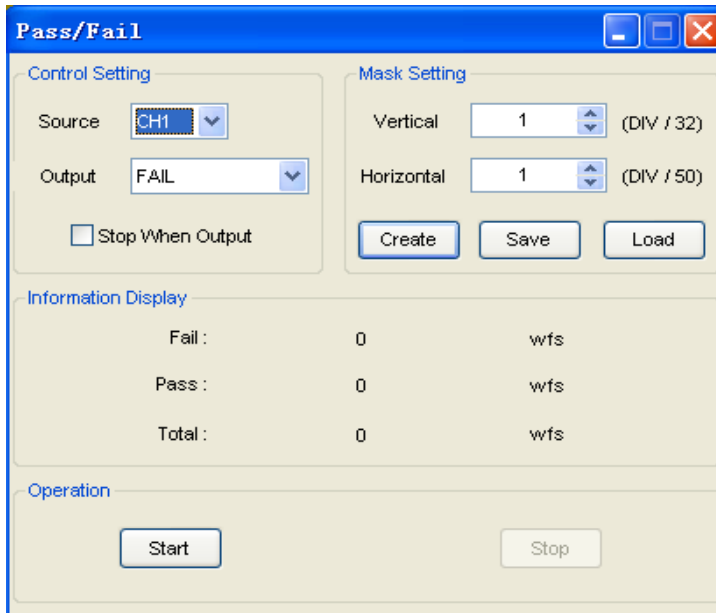
To measure the frequency and **“Vpp”**, you can do these steps as follows:

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.

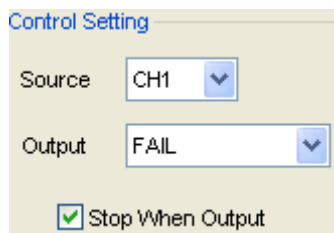


## 4.2 Pass/Fail Test

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:** Source CH1

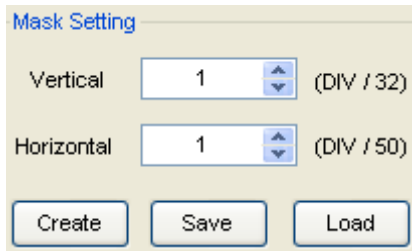
Select the Pass/Fail channel.

**Output:** Output FAIL

Select the Pass/Fail output condition.

**Stop When Output:**  Stop When Output

### Mask Setting



**Vertical:** Vertical  (DIV / 32)

Set the vertical limit range.

**Horizontal:** Horizontal  (DIV / 50)

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:

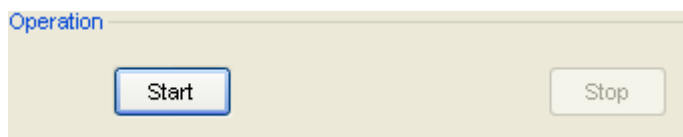
Information Display		
Fail :	1	wfs
Pass :	115	wfs
Total :	116	wfs

Fail: Displays the fail waveform number.

Pass: Displays the pass waveform number.

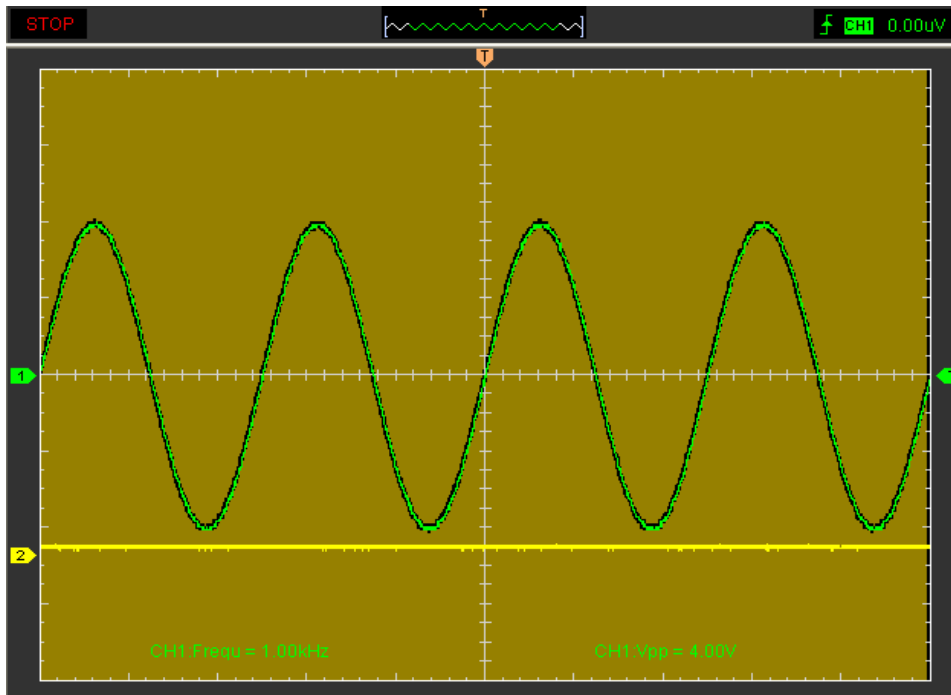
Total: Displays the total Pass/Fail waveform number.

### Operation:



Click “Start” button to start the Pass/Fail test.

Click “Stop” button to start the Pass/Fail test.



**Caution:** Pass/Fail function unavailable in X-Y mode and Roll mode.

## 4.3 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 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 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.

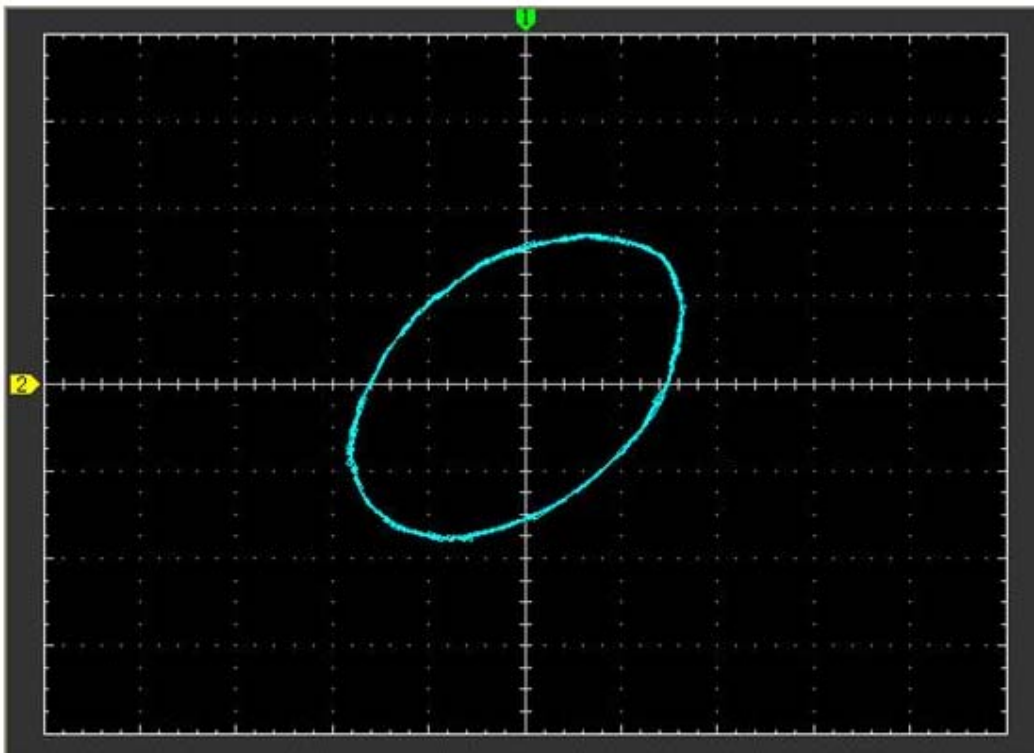
## 4.4 The Application of the X-Y Operation

**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.

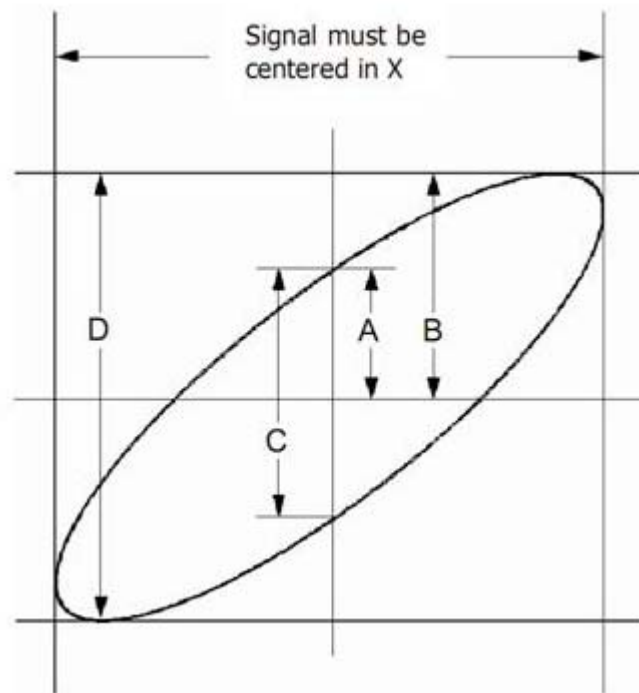
### Do these steps as follows:

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 **AUTO** 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. The following picture shows a typical example.
7. Apply the Ellipse Method to observe the phase difference between the two channels.

### Signal in X-Y Format:



Instruction of the Ellipse Method:



**$\sin\theta = A/B$  or  $C/D$** , where  $\theta$  = phase shift (in degrees) between the two signals.

From the formula above:

**$\theta = \pm \arcsine (A/B)$  or  $\pm \arcsine (C/D)$**

$\theta$  must be in the range of  $(0 \sim \pi/2)$  or  $(3\pi/2 \sim 2\pi)$  if the main axis of the ellipse is between I and III quadrant. If the main axis is at II and IV quadrant,  $\theta$  must be in the range of  $(\pi/2 \sim \pi)$  or  $(\pi \sim 3\pi/2)$ .

## 4.5 Taking Cursor Measurements

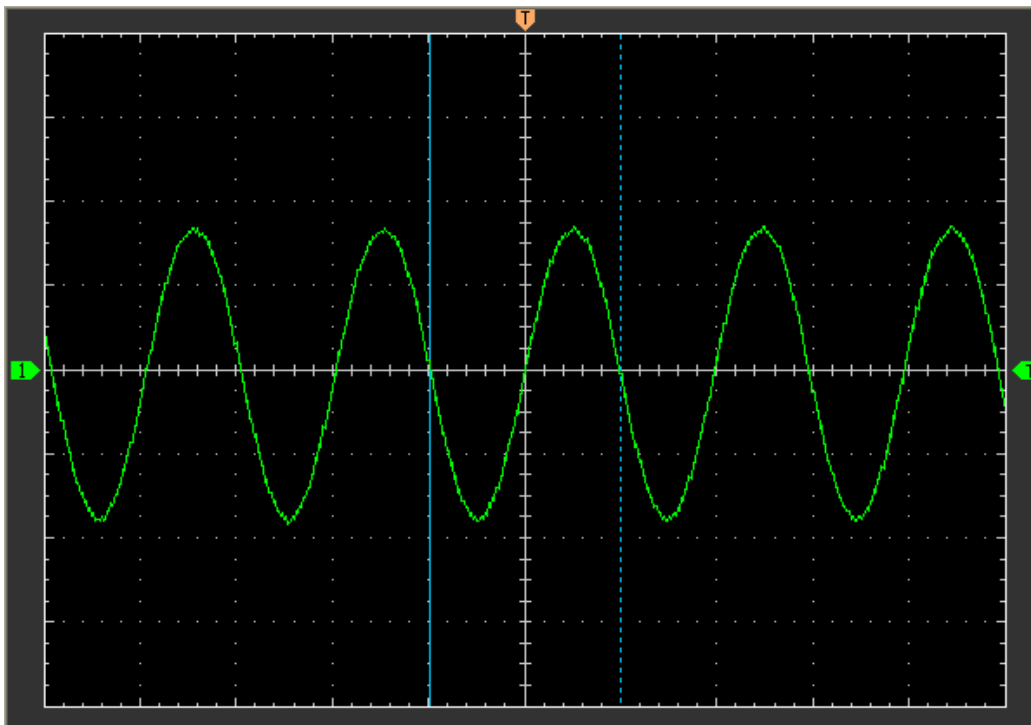
Use cursors to make time and amplitude measurements on a waveform quickly.

### Measure the Frequency or Time of the 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:



Read the details showing in the status bar.

Freq = 12.568 KHz    Time = 79.566 uS

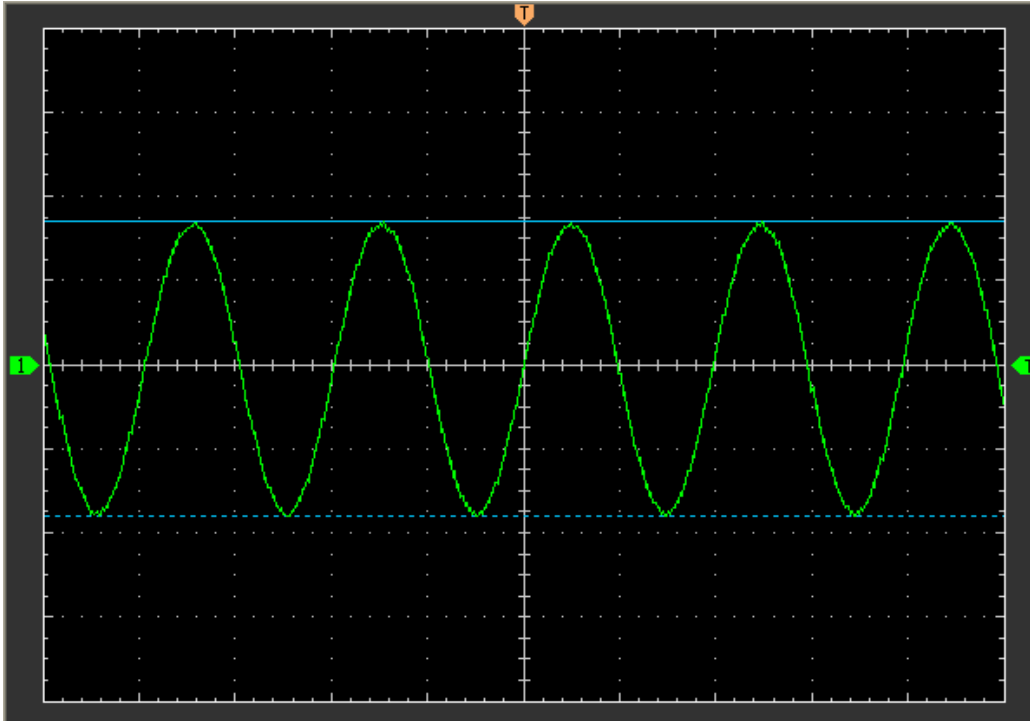
Measure the Amplitude of the First Waveform Peak of the Waveform

**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:



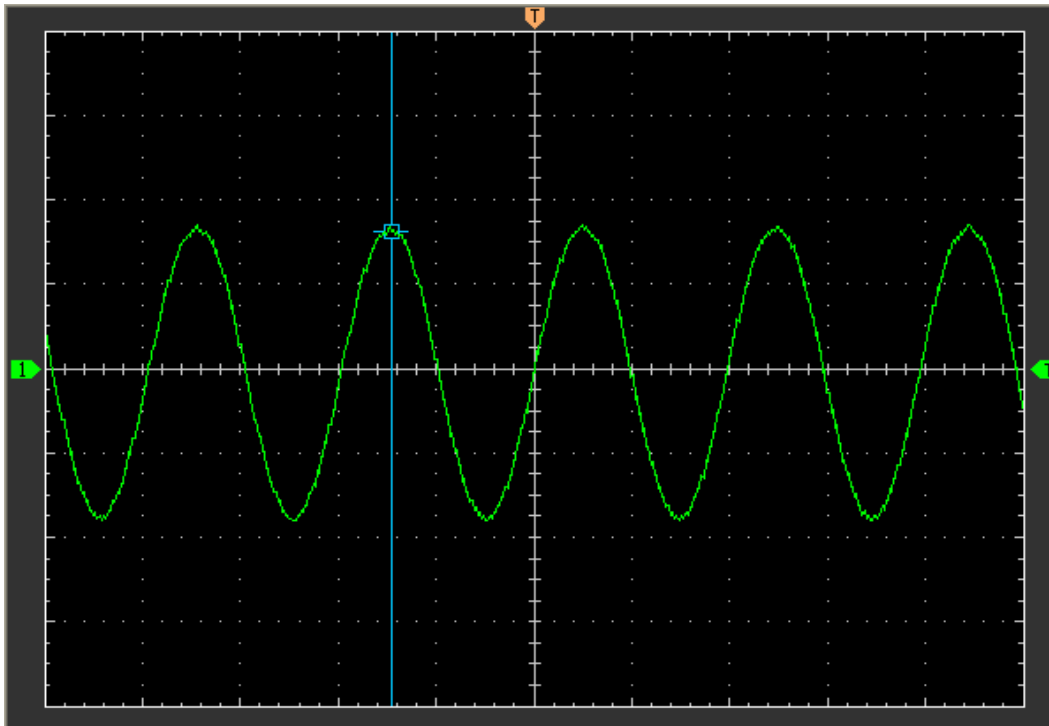
Read the details showing in the status bar.

Vol<sub>t</sub> = 3.502 V

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

Do these steps:

1. Click “**Cursor->Source**”, select CH1 (select CH2 if you want trace CH2).
2. Click “**Cursor->Type**”, select Trace.
3. Click the cursor at the position that you want traced of the wave in the waveform window.

**Trace the Amplitude:**

Read the details showing in the status bar.

Vol t = 1.656 V

**Caution:** Click “**Cursor->Type**” to select “**Cross**”, you can measure time and amplitude at one time.

# Chapter 5 Appendix

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

## Appendix A: Specifications

**Specifications Table:**

<b>Input</b>		
Max. sample rate	Real-time sampling: 250MSa/s using one channel(Hantek6102BE) 250MSa/s using one channel(Hantek6212BE)	
Channels	2	
Bandwidth	100 MHz analog bandwidth(Hantek6102BE) 200 MHz analog bandwidth(Hantek6212BE)	
Vertical Resolution	8 bits/channel (Hantek6102BE) 9 bits/channel (Hantek6212BE)	
Gain range	Hantek6102BE	10mV ~5V/div @ x1 probe(1,2,5 sequence) 100mV ~ 50V/div @ x10 probe 1V ~ 500V/div @ x100 probe 10V ~ 5KV/div @ x1000 probe
	Hantek6212BE	10mV ~10V/div @ x1 probe(1,2,5 sequence) 100mV ~100V/div @ x10 probe 1V ~ 1000V/div @ x100 probe 10V ~ 10KV/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 and Roll	
<b>Timebase</b>		
Timebase range	Hantek6102BE	4ns/div ~ 1h/div(1-2-4 sequence)
	Hantek6212BE	2ns/div ~ 1h/div(1-2-4 sequence)
Acquisition mode	Hantek6102BE	Real-time sampling: 4ns/div ~ 400ms/div. Roll mode: 1s/div ~ 1h/div
	Hantek6212BE	Equivalent sampling: 2ns/div ~ 4us/div Real-time sampling: 10us/div ~ 400ms/div Roll mode: 1s/div ~ 1h/div
Range	10 divisions	
Buffer Size	10K ~ 1M	
<b>Trigger</b>		
Type	Hantek6102BE	Edge trigger
	Hantek6212BE	Edge trigger, Pulse Trigger
Mode	Auto, Normal and Single	

Autoset	Yes
Range	10 divisions
Trigger level	+/-4 divisions
Settability	0.02 div increments
<b>Math</b>	
Measurements	Vp-p, Vmax, Vmin, Vrms, Vamp, Vtop, Vbase, positive overshoot, negative overshoot, average, RMS, cycle RMS, period, frequency, positive pulse width, negative pulse width, rise time, fall time, positive duty cycle, negative duty cycle
Math	Addition, Subtraction, Multiplication, Division
FFT	Rectangular, Hanning, Hamming, Blackman Window
<b>Physical</b>	
Interface	USB2.0
Power	No external power source required. Bus-powered from USB
Dimensions	190 x100 x 35(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 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

In order to keep the instrument clean ,you need to check often whether the channels are dusty or not .Please clean the instrument surface and the channel connecting point as per the following cautions(Make sure the device disconnect form all power sources):

1. Remove loose dust on the outside of the oscilloscope and probes with a lint-free cloth.
2. Use a soft cloth dampened with water to clean the device.