TravelScope series

Version: 1.2.1

Publish: 2012.7

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Safety Information

Please review the following safety information to avoid injury and prevent damage to the DS-1000 or any products connected to it.

Symbol definitions:

	This symbol indicates that the manual should be referred to.
⚠**WARNING**	"WARNING" denotes that, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning until the indicated conditions are fully understood and met.
⚠**CAUTION**	"CAUTION" denotes that, if not correctly performed or adhered to, could result in damage to or destruction of DS-1000. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.
NOTE	"NOTE" denotes that refer to the manual, which provides operational information of which the user should be aware.

⚠WARNING

- **Do not operate without cover(s).**

  Do not operate the DS-1000 with any cover(s) removed. This may result in electric shock or fire hazard if any part(s) inside is touched.

- **Use USB2.0 power only**

  The DS-1000 **should be** powered by the PC's USB2.0 port. Use **only** the DS-1000 USB cable to connect to the PC's USB2.0 port.

- **Do not operate in wet or damp conditions.**

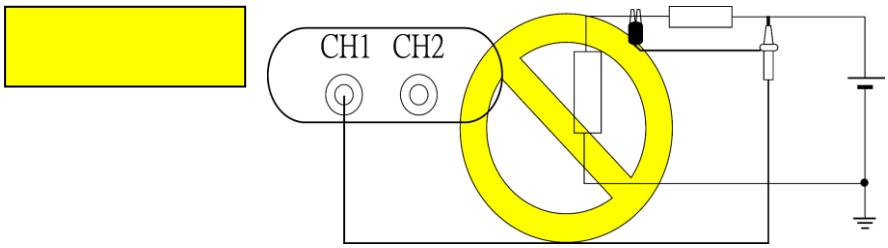
- **Do not modify or operate the DS-1000 if there was any suspected damage, have it**

inspected by qualified service personnel.

- **Connect the Probe Properly**

  Connect the ground lead of the probe to earth ground only. Do not connect the ground lead to an elevated voltage.

  Do not connect or disconnect probes or test leads while they are probed to a voltage source.



⚠CAUTION

- **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.

- **Do not operate in the following installation location**
  - In direct sunlight.
  - In extremely hot and/or humidity areas.
  - With always mechanical vibrations.
  - Around areas with strong lines of magnetic forces or impulse voltage.
- **Remove the USB cable from the DS-1000 if it is not being used.**
- **The temparature of the DS-1000 increases after being used for a while.**

Chapter 1 Introduction

1.1 The Acute digital storage oscilloscope (DSO)

	DS-1000 series	TravelScope series
Sample rate	100MS/s，200MS/s	1GS/s
Bandwidth	200MHz	200MHz
Record length	2K – 2M points/channel	10K – 32M points/channel

1.2 Specifications

DS-1000 series		
Acquisition		
Mode	Sample, Equivalent, Average, Envelop, Peak Detect	
Sampling rate	DS-1102, DS-1202, DS-1302	200MS/s @ 1 ch
		100MS/s @ 2 ch
	DS-1002	100MS/s @ 1 ch
		50MS/s @ 2 ch
Equivalent Sampling	5GS/s (DS-1102,DS-1202,DS-1302) 2.5GS/s (DS-1002)	
Record length	DS-1002, DS-1102: 2k points/channel to 64k points/channel DS-1202: 2k points/channel to 512k points/channel DS-1302: 2k points/channel to 2M points/channel	
Input		
Input Channels	2 channels (stackable up to 3 units as 6 channels.)	
Input Coupling	AC, DC, GND	
Input Impedance	1MΩ ±1% // 21pF±5%	
⚠**Max. Input Voltage**	42Vpk (DC + AC peak)	
Vertical		
Bandwidth	DS-1102, DS-1202, DS-1302: DC to 200MHz DS-1002: DC to 100MHz	
Resolution	9 bits /channel @ 5mV/DIV- 10V/DIV (8 bits @ 2mV/DIV)	
Scale range	2mv/DIV to 10V/DIV (as 2-5-10 step)	
Range	±4 divisions	
DC accuracy	±3%	

BW Limit	Approx. 20MHz	
Horizontal		
Time scale range	5ns/DIV to 10s/DIV (as 1- 2-5 step)	
Time Resolution	200ps	
Accuracy	100ppm	
Range	10 Divisions	
Delay Trigger	DS-1002, DS-1102	320 Divisions
	DS-1202	2560 Divisions
	DS-1302	5120 Divisions
Trigger		
Mode	Auto, Normal and Single (with RUN/STOP hardware button on the DSO device)	
Source	CH1, CH2, Ext-Trig	
Trigger range	±4 divisions	
Sensitivity	5mV/DIV~10V/DIV=1div, 2mV/DIV=1.5div	
Type	Rising, Falling, Delay-Trigger, TV-Trigger (DS-1002 has no TV trigger)	
Level increments	0.1 division	
Measurement and Processing		
Special function	Autoset, Logger	
Measurement	Frequency, Period, Vpp, Vmax, Vmin, Vamp, Vtop, Vbase, Vupper, Vmiddle, Vlower, Vmean, Vrms, Positive overshoot, Negative overshoot, Pulse width	
Cursor	Time difference, Voltage difference	
Math	Add, Sub, Multiplication, Division, XY	

FFT	Rectangular, Blackman, Hann, Hamming, Harris, Triangularm,Cosine, Lanczos, Gaussian (Vertical scale: dBm RMS, dbV RMS, Linear RMS)
Export Data	WORD, EXCEL, CSV, TEXT, HTML, Clipboard, Hardcopy, Preview
External Trigger Input/Output	
EXT-TRIG Input Limitation	TTL Level
EXT-TRIG Acknowledge Level	1.6V to 5V, rising/falling edge
EXT-TRIG Acknowledge Freq.	“>10ns” and “>0.1 TIME/DIV”
TRIG-OUT	3.3v plus, 20ns delay after trigger (for **DS-1000** DSO stack function)
Stack	
Max. channel expand	6 channels (1 Master & 2 Slaves)
Trigger source	Master DSO
Skew	±200 ps in Master-DSO; ±10 ns in Slave-DSO

TravelScope series	
Acquisition	
Mode	Sample, Average, Envelope, Peak Detect, High Resolution
Sampling rate	1 GS/s @ 1-channel; 500 MS/s @ 2-channel
Record length	Normal: 10K pts/ch
	Single-shot: TS2202A: 10K pts/ch; TS2212A: 64M pts/ch
Input	
Input channels	2 (Ch1, Ch2)
Input coupling	AC/DC
Input impedance	1MΩ || 18pF
Overvoltage protection	±100V (DC + AC Peak)
Ch-Ch skew	100 ps between two channels with the same scale & coupling settings
Vertical	
Bandwidth	200 MHz @ 1-channel; 100 MHz @ 2-channels
Rise Time	1.75 ns @ 200 MHz; 3.5 ns @ 100 MHz
Resolution	8 bits
Input scale	2 mV/div to 10 V/div (Full Scale: ±4 div/screen, ±1 div beyond screen)
Position range	±4 divisions
Offset range	±150 V @ 2, 5, 10 V/div;

	±15 V @ 0.2, 0.5, 1 V/div; ±1.5 V @ 2, 5, 10, 20, 50, 100 mV/div
DC accuracy	±3% of full-scale
Bandwidth limit	20 MHz, 100 MHz or Full
Horizontal	
Time scale	2 ns/div to 10 s/div (10 div/screen)
Time resolution	40 ps
Time accuracy	±10 ppm
Delay range	Pre-trigger 0 to 100% of 1 screen; Post-trigger up to 50 sec.
Trigger	
Trigger mode	Auto, Normal, Single, Untriggered-Roll (@ Time scale ≧ 200 ms/div)
Source	Ch1, Ch2, External (TTL only)
Coupling	DC, AC, LF reject (50KHz), HF reject (50KHz), Noise reject
Trigger range	±4 div from window center
Vertical sensitivity	1 div or 5 mV @ < 10 mV/div; 0.6 div @ ≧ 10 mV/div
Holdoff time	~60 ns to 10 sec.
Trigger type	Edge, Video/TV, Pulse Width
Basic trigger	Rising, Falling, Altermate, Either
Advanced trigger	
Edge	A-trigger
Video/TV	NTSC, PAL, SECAM, Field, Scan Line
Width	Positive/Negative/Any <, >, =, ≠ ange from 8 ns to 50 sec

Runt	Positive/Negative/Runt+Pulse Width Range from 8 ns to 50 sec
Pattern	AND, OR, NAND, NOR
Measurement/Processing	
Special Function	Autoset, Logger
Measurement	Frequency, Period, Vpp, Vmax, Vmin, Vamp, Vhigh, Vlow, Vmean, Vrms, Positive overshoot, Negative overshoot, Pulse Width
Cursor	Trigger difference, Voltage difference
Math	Add, Sub, Multiplication, Division, XY
Cursor	Time difference, Voltage difference
Math	Add, Sub, Multiplication, Division, XY
FFT	Rectangular, Blackman, Hann, Hamming, Harris, Triangular, Cosine, Lanczos, Gaussian.(Vertical Scale: dBm RMS, dbV RMS, Linear RMS)
Export Data	WORD, EXCEL, CSV, TEXT, HTML, Clipboard, Hardcopy, Preview
I/O port	
Trig-In	TTL 3.3V level (Rising/ Falling)
Trigger pulse approval	> 8 ns
Trig-Out	TTL 3.3 V
Stack	
Max. channels expand	6 channels (3x TravelScopes, 1 Master & 2 Slaves)
Trigger source	Only available for Master scope

Skew between devices	±8 ns between Master & Slave channels
Function Generator	
Output channels	2 (Gen. 1, Gen. 2)
Output impedance	600Ω
Frequency	DC to 1 MHz
Amplitude	0 V to 2.5 V (to 1MΩ load) ± 50mV
Offset	Fixed at 0 V @ Dual channel mode -1.25 V to 1.25 V @ Single channel mode (Gen. 2 only)
FG mode	Sine, Square, Pulse, Triangle, Ramp (Sawtooth), DC
Modulation	AM, FM, PM, ASK, FSK, PSK
Others	Sweep, Burst

1.3 The DS-1000 packing list

	Contents	The DS-1000 series
1.	DSO device	1
2.	250MHz probes (1x/10x)	2
3.	Probe accessory pack	2
4.	USB A-B cable	1
5.	Installation CD	1
6.	Quick menu	1
7.	Soft case	1

1.	2.	3.	4.	5.
				

1.4 The TravelScope packing list

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1.5 System Requirement

- Above Intel Pentium-III compatible PC.
- USB2.0 port.
- Windows 2000/XP/Vista(-32/-64)/ Win7(-32/-64).
- 512 MB Memory available.
- Disk memory 250 MB or more.
- CD-ROM for installation program.
- VGA 800 X 600(1024 X 768 or higher recommended).
- Keyboard & Mouse.

Chapter 2 Installation

2.1 Installation Procedures

2.1.1 Driver Installation for Windows XP

(1) Insert the installation CD and connect the DS-1000 with your PC.

(2) Enter the hardware wizard when the Windows OS find an USB device (Figure 1) and check “yes. This time only”.

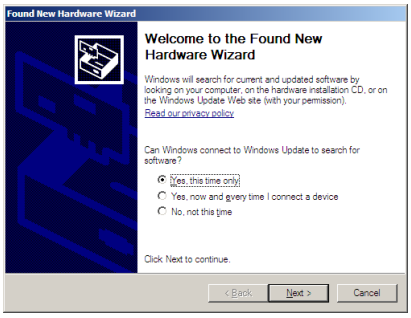


Figure 1

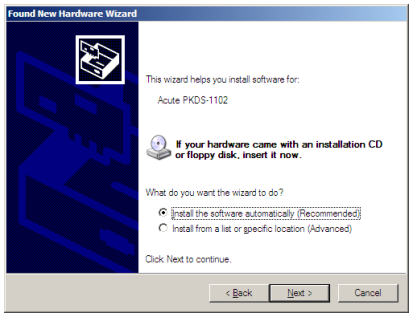


Figure 2

(3) Choose “Install the software automatically” (Recommended) to find the proper driver automatically (Figure 2). Click “Next”.

(4) Click “Next” when a driver is found.

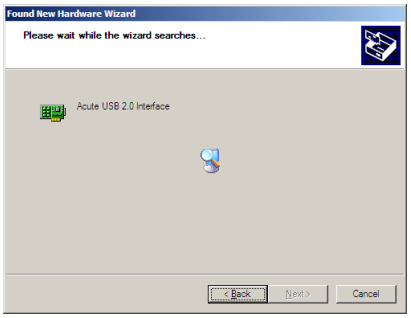


Figure 3

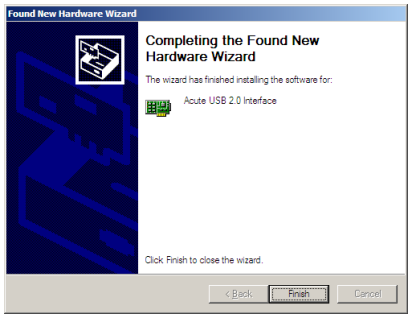


Figure 4

(5) You will see the “Acute USB 2.0 Interface” in the Device Manager (Figure 6). Please check our FAQ at www.acute.com.tw or e-mail us at service@acute.com.tw if there is any installation problem.

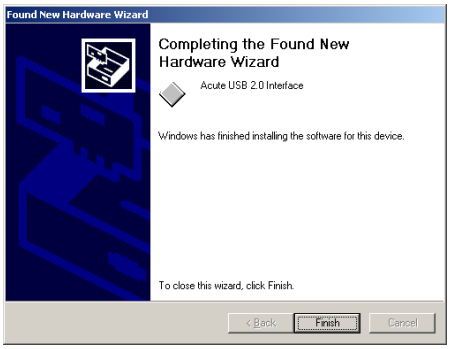


Figure 5

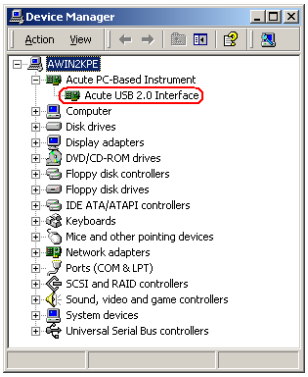


Figure 6

2.1.2 Install the driver manually

(1) Insert the installation CD and connect the DS-1000 with your PC. Choose "Add Device" in the Control panel (Figure 1).

Figure 1

Figure 2

(2) Choose "Intall from a list or specific location (Advanced)" (Figure 2) and click "Next".

(3) Choose "Search for the best briver in these locations" (Figure 3); select the DSO directory and click "Next".

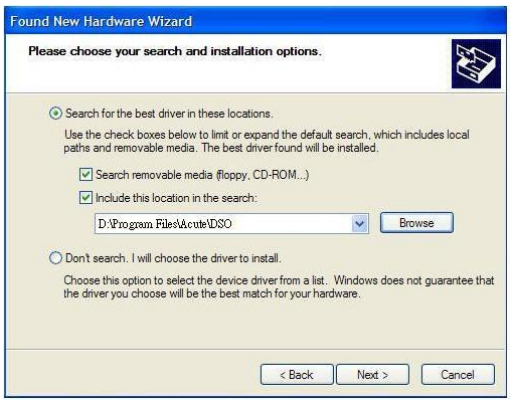


Figure 3

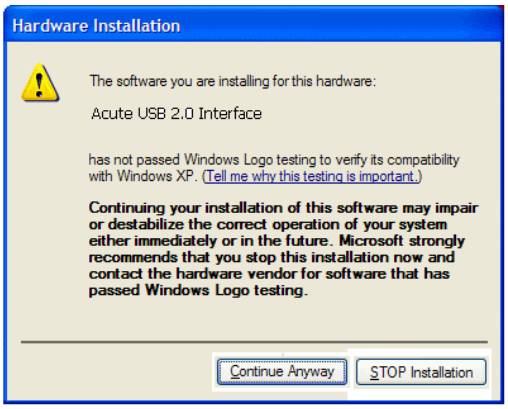


Figure 4

(4) Click "Continue Anyway" (Figure 4) to continue the installation procedure.

(5) Click "Finish" (Figure 5) after the DSO driver is installed. You may see the "Acute USB 2.0 Interface" in Device Manager (Figure 6).

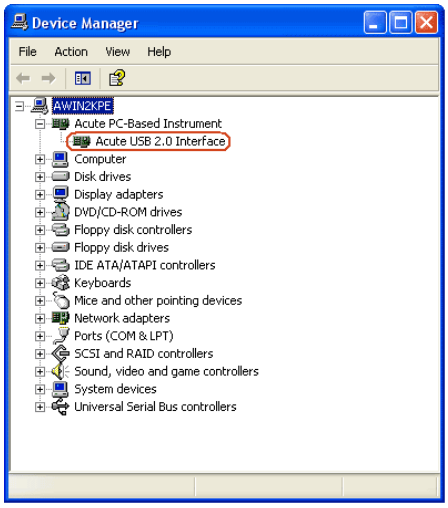


Figure 5 **Figure 6**

You will see the “Acute USB 2.0 Interface” in the Device Manager (Figure 6).

Please check our FAQ at www.acute.com.tw or e-mail us at

service@acute.com.tw if there is any installation problem.

2.1.3 Install the DSO software

(1) Insert the installation CD into your PC.

(2) Double click the auto-installation procedure. Run setup.exe at the CD-ROM root directory if the auto-installation does not work. The DSO software will enter DEMO mode if the DSO is not connected with the PC.

(3) You will find the DSO software icon ()after the installation.

(4) If the DSO software enters “DEMO Mode” when the DSO is connected with your PC, please check the USB cable or e-mail us at service@acute.com.tw.

2.2 Probe calibration

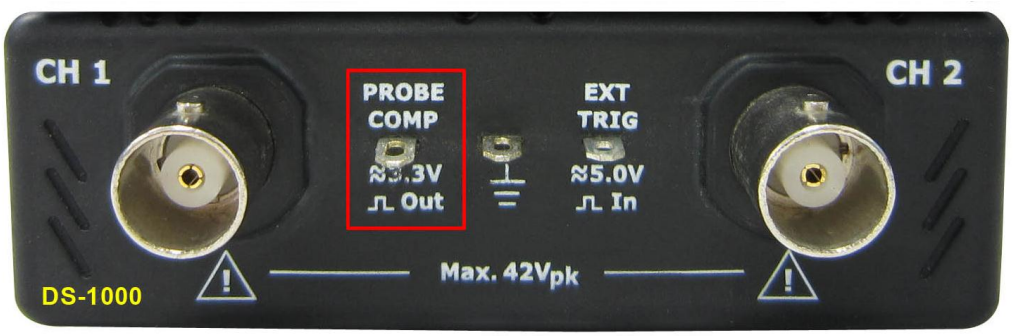
Please calibrate the two probes at the first time use.

(1) Connect the two probes with DSO's 2 channels.

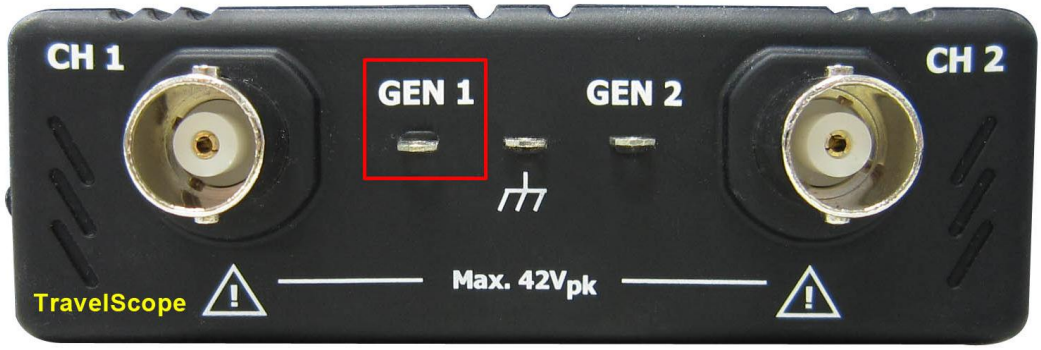
(2) Switch the Probe to "x10".

(3) Connect two probe ground pins with the DSO's ground terminator.

(4) DS-1000: Connect two probes with the "Probe Comp. (3.3V)" pin.



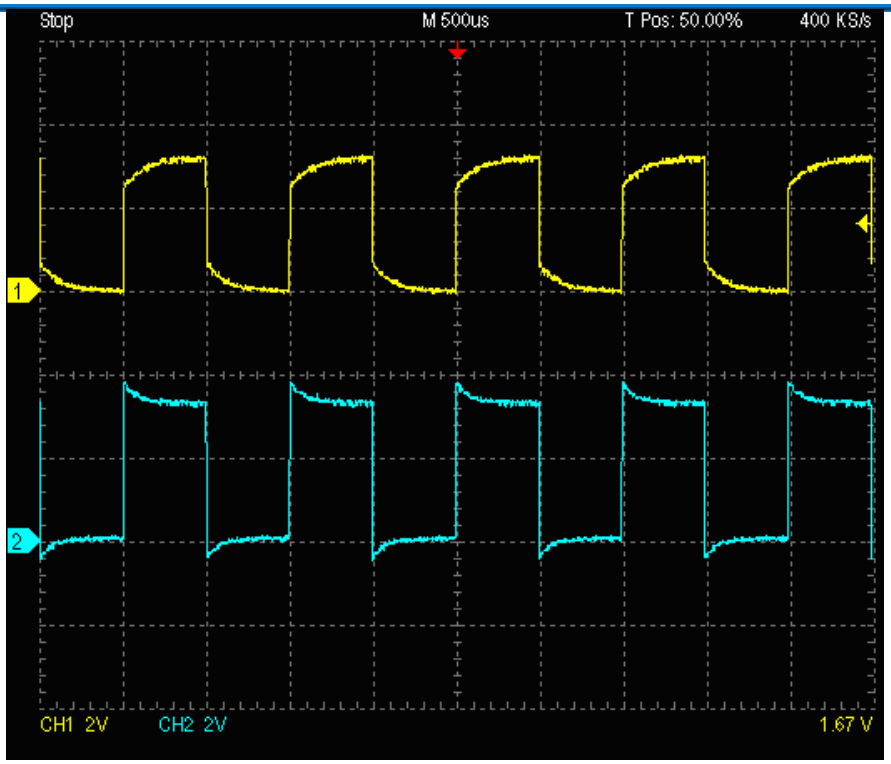
TravelScope: Connect two probes with the "GEN 1" pin.



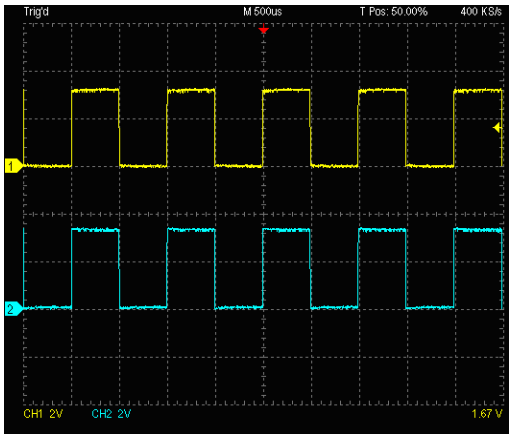
(5) Run the DSO software.

(6) Set the Volt/Div = 2v and the Time/Div = 500us.

(7) If you see the waveforms below, please follow step (8).



(8) Adjust the trimmer near the probe's BNC connector and modify the waveform to to the following shapes.



2.3 DS-1000 series Calibration

(1) Please calibrate the DS-1000 whenever the DSO connected with a different PC. Connect the two probes with DSO's 2 channels.

(2) Switch the Probe to "x10".

(3) Connect two probes with the DSO's ground terminator.

(4) DS-1000: Connect two probes with the "Probe Comp. (3.3V)" pin.

(5) Switch the Probe to "REF" position.

(6) Push the "Utility" button.

(7) Push "Calibration" of Function Button.

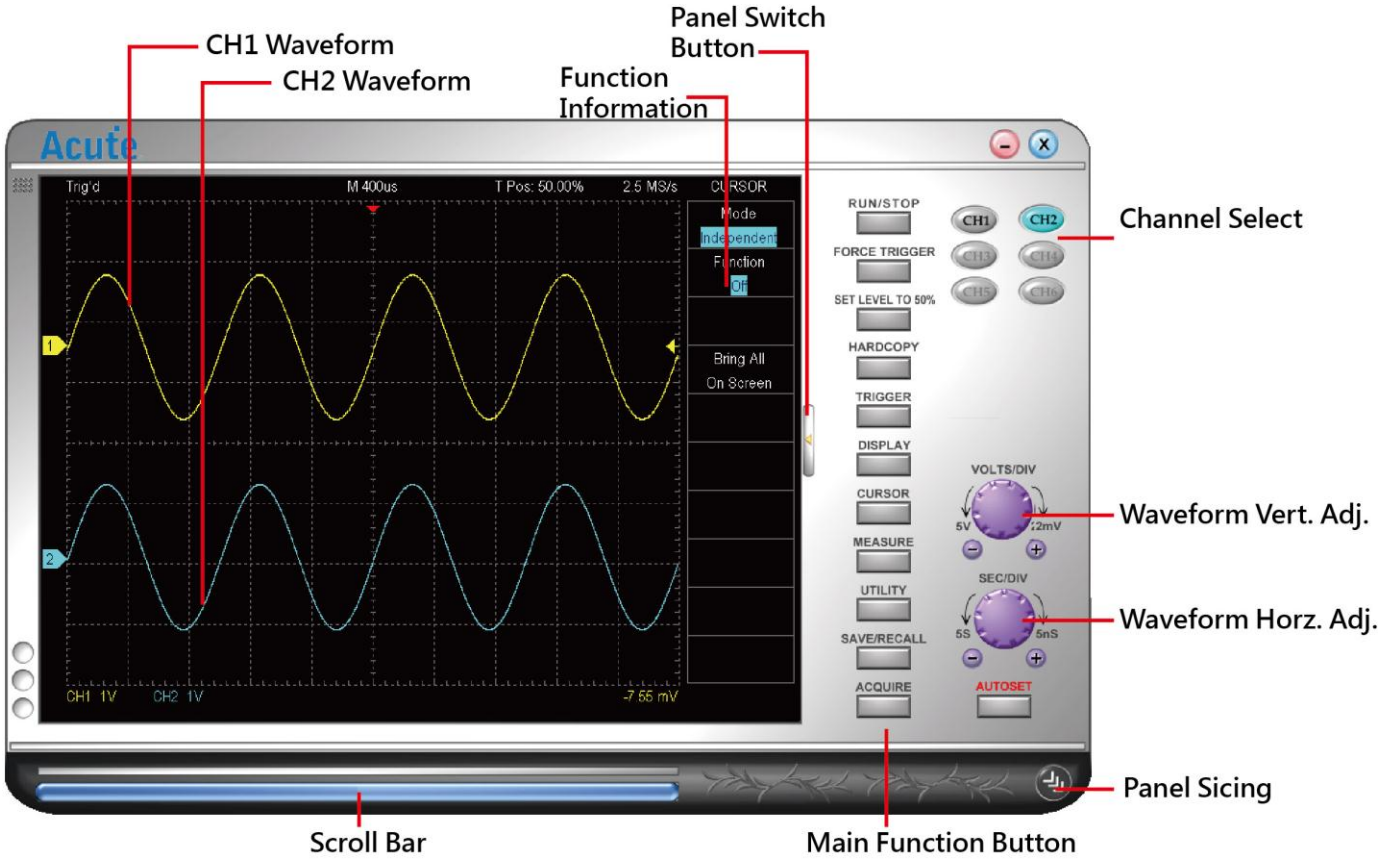
(8) The calibration software will ask you to switch the Probe to"x10".

(9) You can change the time base or vertical division after the calibration to check the result.

(10) You need to claibrate the DSO again each time you use a different PC because the calibration information is stored in the PC.

Chapter 3 Operations

3.1 Window



3.2 Operation

3.2.1 Channel Switch Button

There are 6 channel bottons (CH1, CH2…, CH6) on the upper right of the DSO software window. When you use one DSO, only CH1 and CH2 are available and the rest channel buttons will be disabled in gray color. CH1, with gray button and black fonts, is available but not activated; CH2 is in blue color when activated. Each activated channel button has its own color which is identical to that of its waveform. Each time you press the channel button will turn on/off the diplay of the channel.

3.2.2 VOLTS/DIV Knob

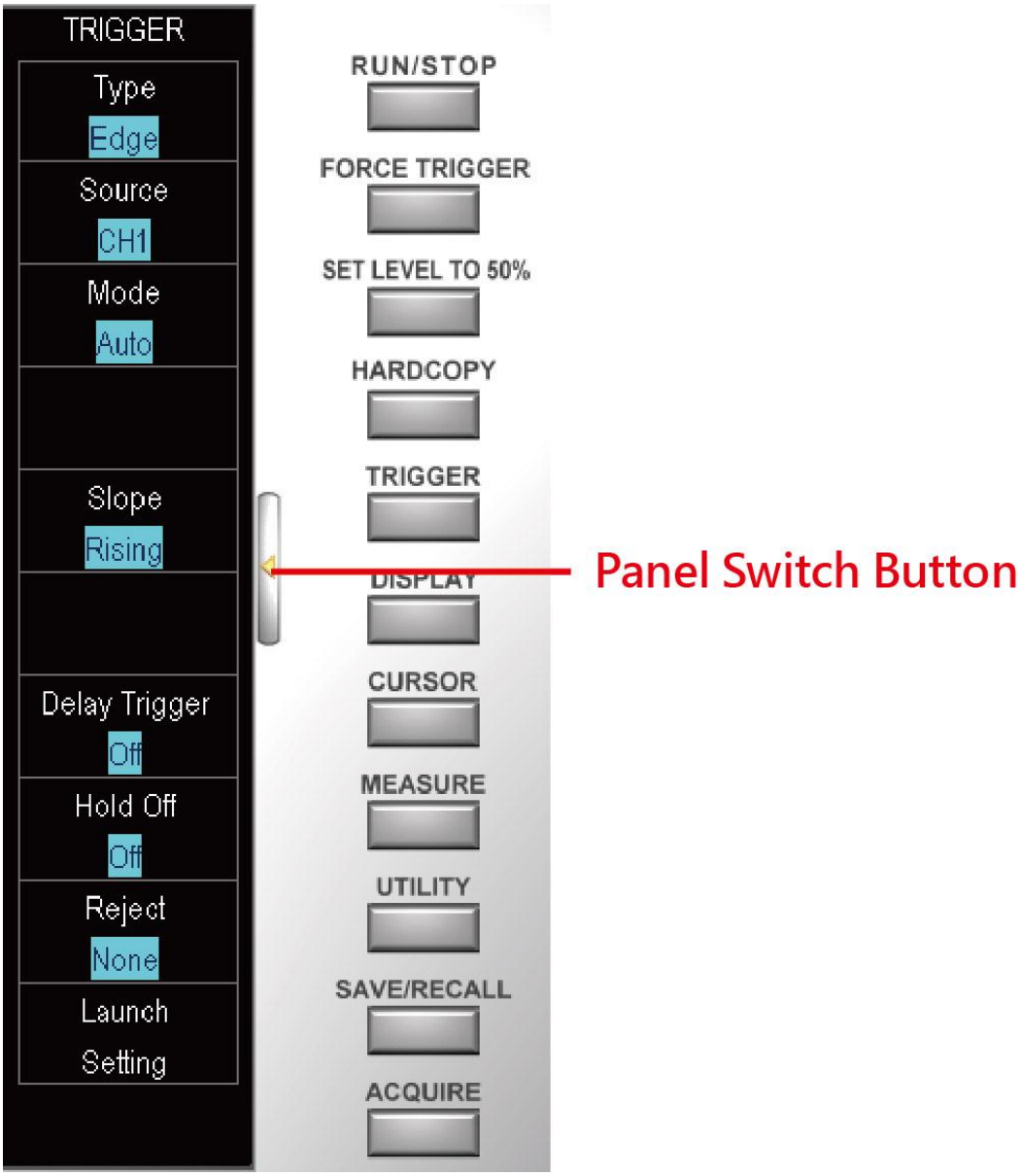
The VOLTS/DIV knob is used to change the voltage scale. There are 8 vertical divisions for the voltage scale on the software window and the voltage scale is shown on the window's lower-left corner.. For example, the window will display "CH1 2.00V"if the voltage scale is 2 Volts for each vertical division and the total voltage of all 8 vertical divisions are 16 Volts. There are two small buttons under the VOLTS/DIV knob, one is "-"(zoom out) and the other is "+" (zoom in). The mouse wheel can be used to adjust the voltage scale faster.

3.2.3 TIME/DIV Knob

The TIME/DIV knob is used to change the time scale. There are 10 horizontal time divisions on the software window. When the TIME/DIV shows "M 50us", it means s each horizontal division is 50us. There are two small buttons under the TIME/DIV knob, one is "–" (zoom out) and the other is "+" (zoom in) to change the time scale.

. The mouse wheel can be used to adjust the time scale faster.

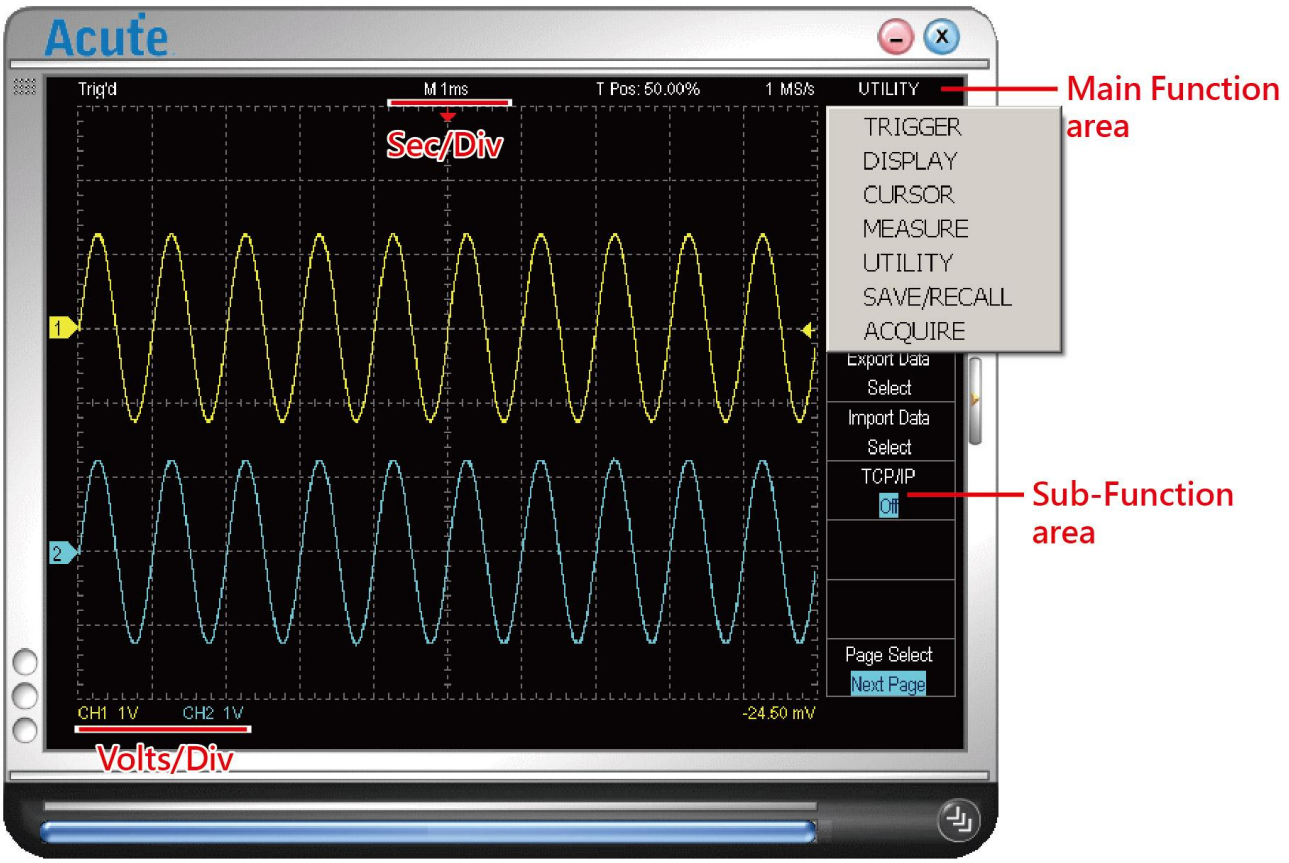
3.2.4 Panel Switch Button



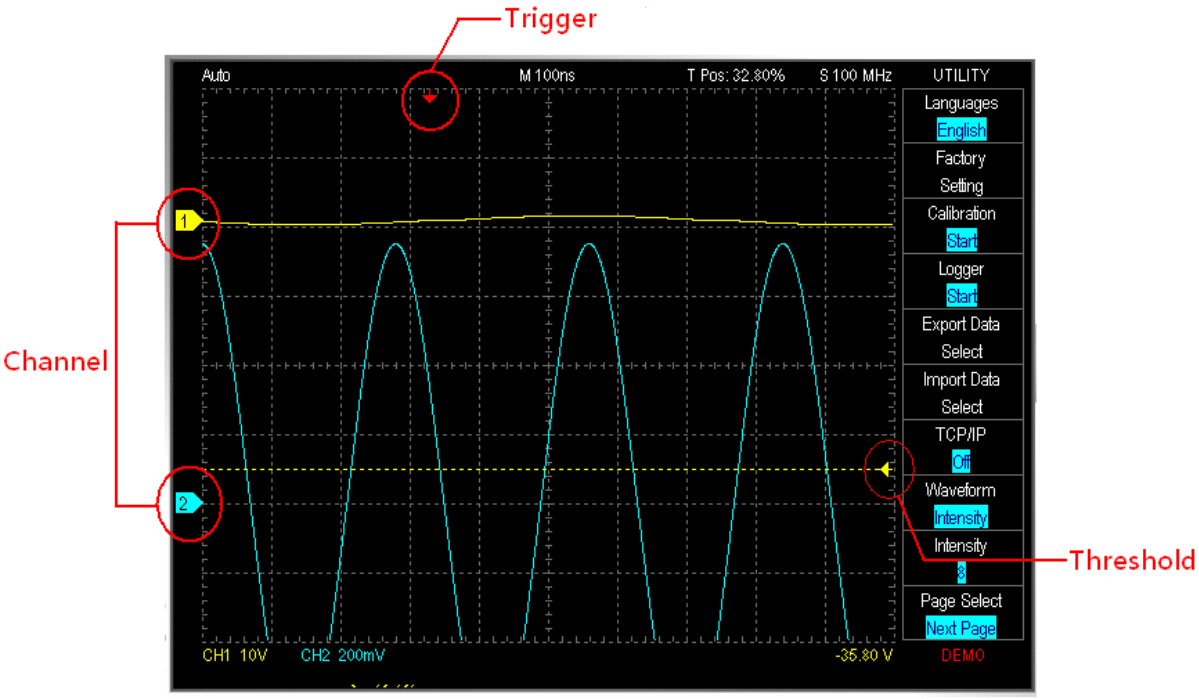
The DSO software window has 2 kinds of display panels; one is Skin Panel with no function buttons, the other is Full Panel with function buttons on the right. “Panel Switch Button” is used to switch the window from Skin Panel to Full Panel or vice versa.

3.2.5 Skin Panel

You may find the hidden functions from the pull-down menu on the upper right in the Skin Panel.



3.2.6 Threshold



Threshold is an arrow sign on the right of the panel. You may drag the arrow to adjust the threshold (a horizontal dash line),to show the threshold information on the lower right of the panel.

3.2.7 Channel

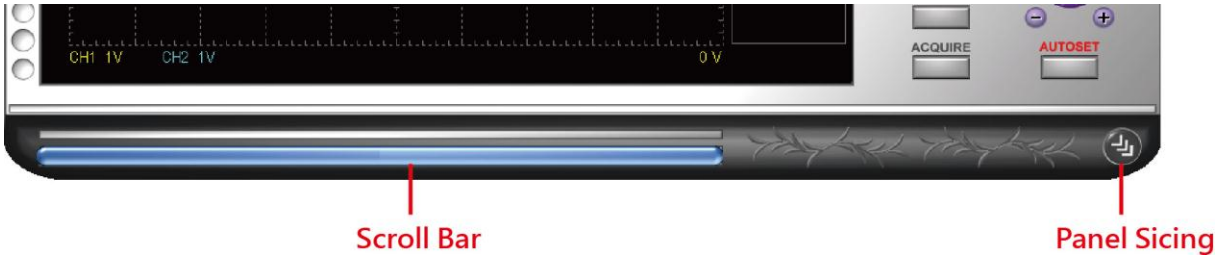
The channel numbers are shown on the left of the panel; you may move the channel to adjust its threshold.

3.2.8 Trigger Position

Trigger is a red arrow sign on the top of the panel; you can drag the trigger to adjust its time.

3.2.9 Scroll Bar

Scroll bar is a light blue line under the panel. You can see the waveform in different time by moving the scroll bar. You may double click the mouse on the scroll bar to move it to the middle (50%) of the time

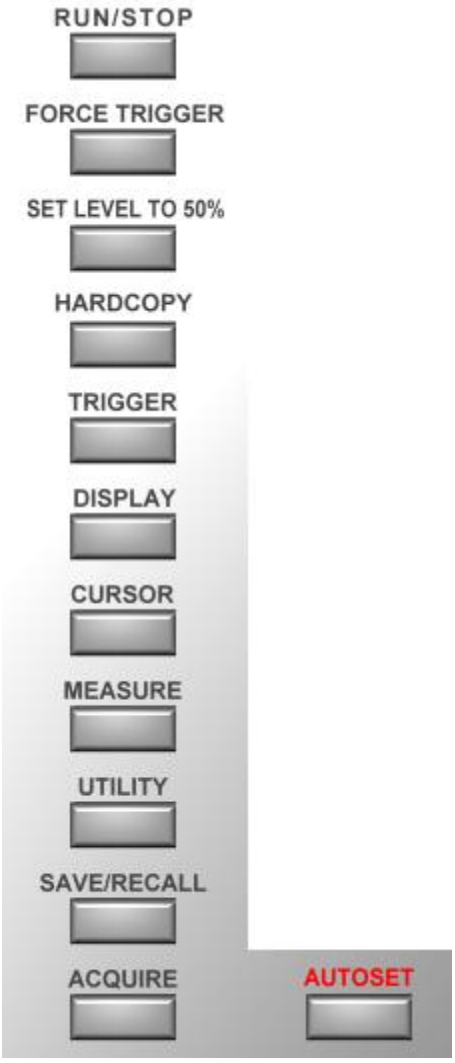


3.2.10 Panel Sizing Knob

Panel sizing knob is on the lower right of the panel. You can drag the knob to adjust the size of the panel.

3.2.11 Main Function Button

You may click the mouse to trigger each sub function.



(1) Run/Stop

RUN/STOP icon starts/stops the acquisition process. The DSO also has a black hardware RUN/STOP button which does the same function.

(2) Force trigger

When the trigger mode is Normal or Single Shot, but the DSO can not be triggered, then “FORCE TRIGGER” button is used to force the DSO to trigger the signal.

(3) Set level to 50%

Click the “Set to 50%” button will set the DSO

trigger threshold to the average voltage of the signal's Vpp.

(4) Hardcopy

Click the "HardCopy" button to print the waveform on your PC's window. You can press "Utility" → "export" to preview the waveform.

(5) Trigger

	DS-1002/DS-1102	DS1202/DS-1302	TraveScope
Edge	○	○	○
Video		○	○
Width			○
Runt			○
Pattern			○

a. Trigger Type

- **edge**

Rising/falling/Either/Alternate signals (not Video signals) will be be triggered.

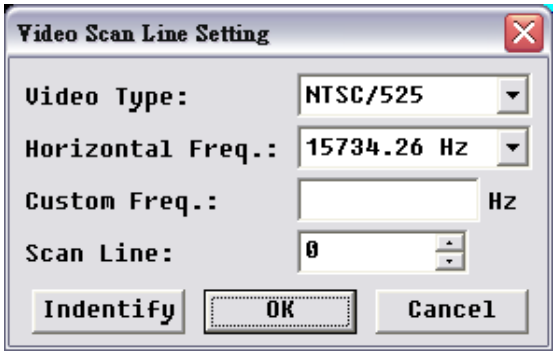
- **Video (only for the DS-1202, DS-1302, TS2202A, TS2212A)**

Video trigger can trigger video signals like NTSC、PAL or SECAM.

Related operations:

Move cursor to "Line #", and use mouse wheel to set scan line.

In DS-1000 series, "Video Trigger On" sets the trigger to One Field, Odd Field, Even Field, or a Scan Line. It provides Video Scan Line Setting for DS-1202, DS-1302.



Steps:

– You can choose the numbers of the scan line.

– Right-click the mouse to show a dialog box to choose the video type, horizontal frequency or sacn line.

– **Video Type:** MTSC, PAL or SECAM.

– **Horizontal Freq.:** Adjust the frequency according to the tested signal

– **Identify:** Click **Identity** to automatically identify the video type and horizontal frequency.

– Click "Cursor" button to set the Horizontal Unit as IRE will make the video measurement easier.

- **Width (only for the TS2202A, TS2212A)**

Trigger when the pulse width matches the following:

– **Width mode:** select Positive/Negative/Any pulse with different conditions (<, <, =, ≠).

– **Width time:** The width time is from 8ns to 50s depending upon different width mode and sampling rate.

If the width time mode is "=" or "≠", the range is ±5%.

For example: Setwidth time = (≠) 100 ms, trigger when pulse width = (≠) 95~105 ms.

- **Runt (only for the TS2202A, TS2212A)**

Defined by pulses that enter and exit between two defined amplitude thresholds. A runt can also be time qualified with a pulse width between 8 ns and 50 s. A runt polarity of Positive, Negative, or Either can be selected.

Runt Mode	Width Time	Descript
High		Postive pulse
Low		Negative pulse
Either		Any pulse
High + Width	8ns ~ 50s	Postive pulse width in different condition
Low + Width	8ns ~ 50s	Negative pulse width in different condition

Either + Width	8ns ~ 50s	Any pulse width in different condition

- **Pattern (only for the TS2202A, TS2212A)**

Trigger on any logic combination of 2 channels.(AND/OR/NAND/NOR)

b. Slope

Slope is used to adjust the Edge slope.

c. Source

Source is to choose a channel's signals to be the trigger source.

d. Mode

Trigger has 3 modes: Auto, Normal, and Single Shot. Recorde length can be adjusted in Single Shot.

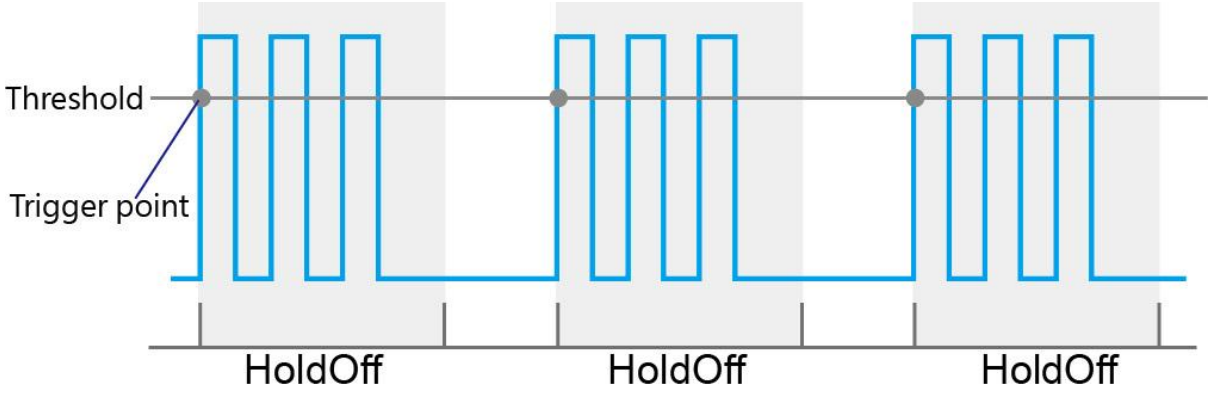
	DSO Series	**Record length**
DS-1000 series	DS-1002 DS-1102	2K – 64K
	DS-1202	2K – 512K
	DS-1302	2K – 2M
TravelScope series	TS2202	10K
	TS2212	10K – 64M

e. Delay trigger

The DSO can delay the trigger up to 50 seconds after the trigger conditions matched. Delay time on UI: 

f. Hold Off Time

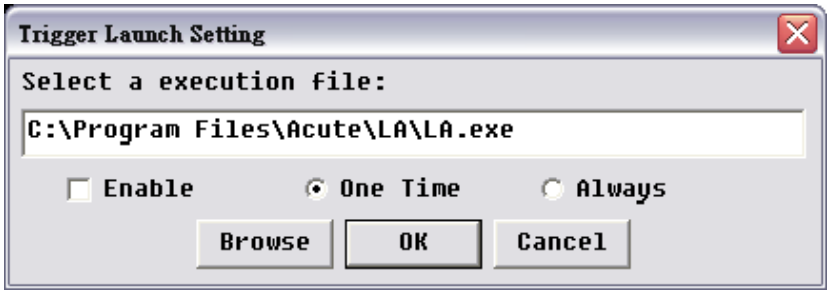
Stop trigger function during the hold off time after trigger, and the range is 8ns to 50s



g. Reject

Use high frequency reject (H.F. Rej.), low frequency reject (L.F. Rej.) or noise reject (Noise Rej.) to filter noises near the trigger point.

h. Launch Setting



Launch Setting, a sub function under Trigger,is used to launch an external execution file when the trigger is activated. You may enable this function in the "Trigger" window by clicking "Trigger Launch Setting" and "Enable". You may launch the trigger setting by "One Time" or "Always"; "One Time" means the external execution file will be launched only once when the trigger is activated and "Always" means the external file will always be launched when the triggers are activated. However, "Always" may cause your computer crash if too many external files are launched.

(6) Display

a. Display/Math

- **Display(1/3):**

  – **CH Display**

  Turn on/off to display the channel.

  – **CH Coupling**

  AC, DC or GND.

  – **CH Invert**

  Invert the waveform.

  – **CH Offset (TravelScope only)**

  Move the waveform vertically.

Offset	Volts/Div
±150V	2, 5, 10V/div
±15V	0.2, 0.5, 1V/div
±1.5V	2,5, 10, 20, 50, 100mV/div

  – **CH Probe**

  The probe option (current, x2000, x1000, 200, x100, x10 or x1) on the DSO software window must be identical with the probe.

  – **CH Bandwidth**

  This is a bandwidth limitation; once checked, , then the signal higher than 20 MHz (or100 MHz) will be filtered.

- **Display(2/3):**

  – **Draw Type**

  Draw the waveform by dots (Dot) or in line (Line).

  – **Interpolation**

  Use sinc interpolation connect sample points with curves.

  – **Persistent**

Keep the old waveform on the window while display the new waveform to see the maximum difference between waveforms.

- **Math(3/3):**

– **Math**

"A+B", "A-B", "B-A", "AxB" or "A/B" is the mathematical result of the values of CH1 and CH2.

"X-Y" is the Lissajous figure.

– **FFT**

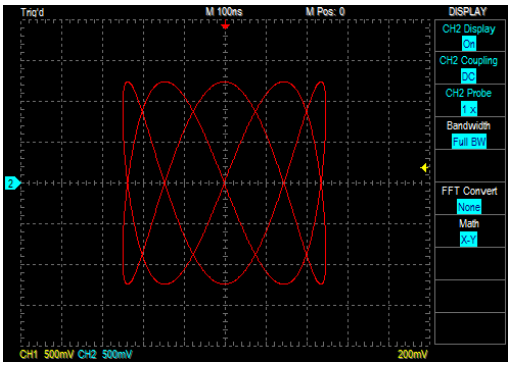
The selected channel can be fransformed as FFT.

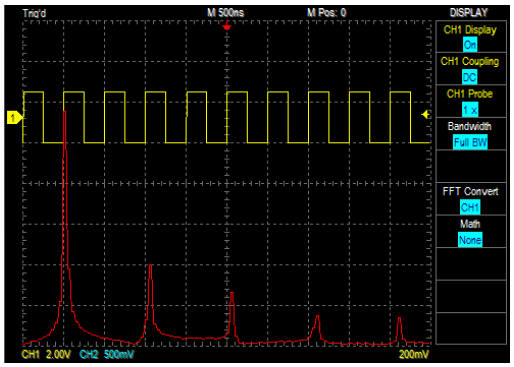
– **FFT Scale**

The FFT Scale has three modes: Linear RMS, dbV RMS, dBm Rms.

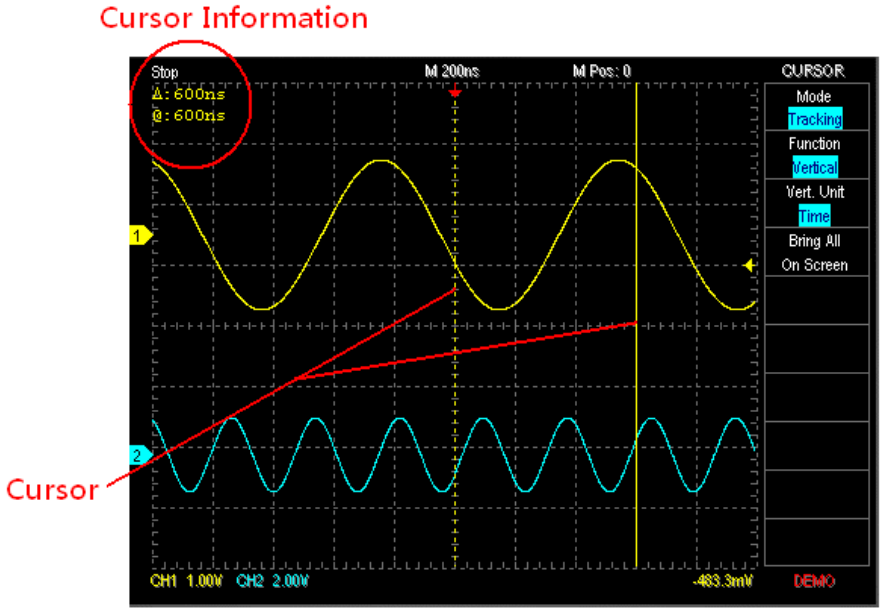
– **FFT Window**

The FFT window includes "Triangular", "Cosine", "Lanczos", "Gaussian", "Rectangular", "Blackman", "Hann", "Hamming" and "Harris".





(7) Cursor



There are two cursors: Time (vertical line) and Voltage (horizontal line). The two lines can be displayed in one yellow solid line (when being dragged) and one yellow dashed line or both not be displayed. There are two cursor icons: "@" and "Δ". "@" means the difference of time or voltage between the cursor and the Trigger point. "Δ" means the difference of time or voltage between two cursors.

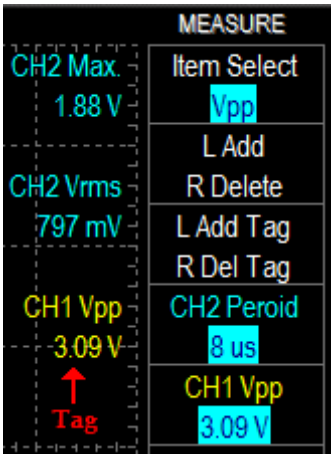
Independent mode: Cursors can be moved separately.

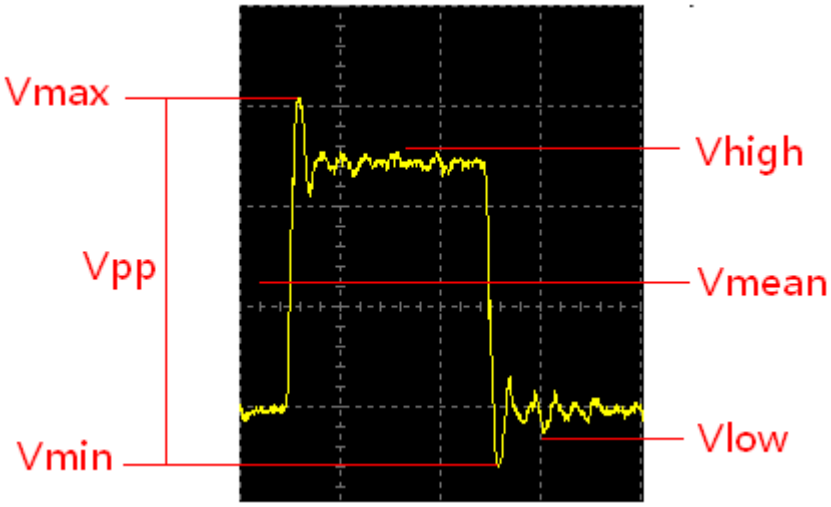
Tracking mode: Cursors can be moved together.

When the cursor(s) is(are) out of the window, you may click the "bring all on screen" button to bring all cursors back to the window.

(8) Measurement

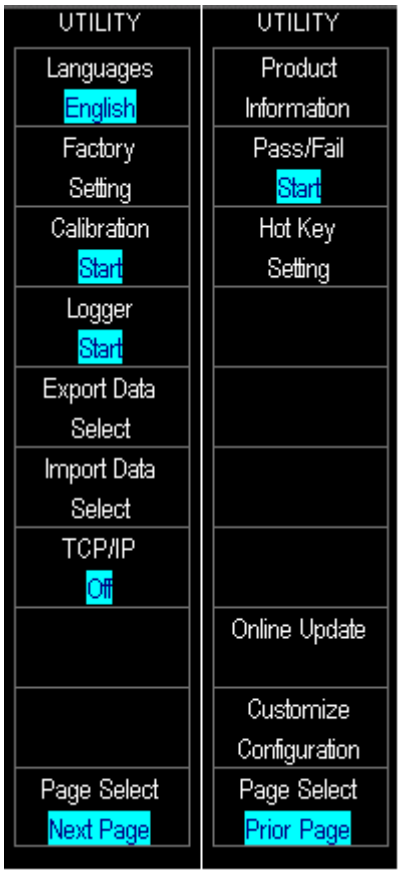
Click "Item Select" under Measurement and you will see a pull-down menu with the items listed below. Measurement can be displayed in the Data area or the Waveform area. "Add" and "Delete" buttons are used in Data area to add or delete the measurement value. "Add Tag" and "Del Tag" buttons are used in Waveform area to add or delete the measurement value.





Item	Description
Frequency	Waveform frequency
Period	Waveform period
Max.	Max. voltage(Vmax)
Min.	Min. voltage(Vmin)
High	Vhigh = Vmax + Vpp x 90%
Low	Vlow = Vmin + Vpp x 10%
Vpp	Vpp = Vmax – Vmin
Amplitude	Vamp = Vhigh – Vlow
Vrms	RMS
Mean	Vmean = (Vmax + Vmin)/2
+Duty	Positive pulse width as a fraction of the period.
-Duty	Negative pulse width as a fraction of the period.
+Width	Positive pulse width.
-Width	Negative pulse width.

(9) Utility



a. Languages

The software supports English, Spanish, French, Simplified Chinese or Traditional Chinese.

b. Factory Setting

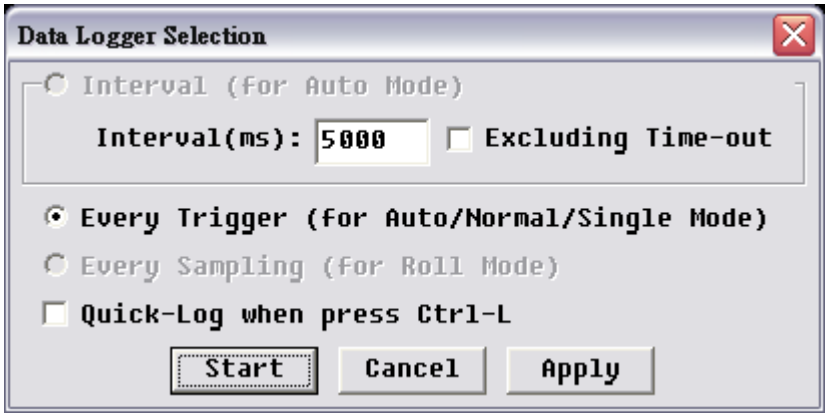
Click the “Factory Setting” button to resume all the setup values back to the factory origins.

c. Calibration

Click the “Calibration” to claibrate the DSO.

d. Logger

“Logger” logs the waveform data in your computer’s hard disk; “Logger” has three sub functions: Interval, Every Trigger, and Every Sampling.



- **Interval (Auto Mode only)**

  “Interval” saves waveform data in an interval (in tens of milli-seconds at least) that can be defined in edit box and only works in “Auto” mode. “Interval” logs waveform whatever in trigger-activated or time-out periods. You may only log trigger-activated waveform by clicking “excluding time-out”.

- **Every Trigger (Auto/Normal/Single Mode)**

"Every Trigger" saves waveform data whenever trigger activated in each of "Auto", "Normal" or "Single" mode.

- **Every Sampling (Roll Mode only)**

  "Every Sampling" only works in "Roll" mode (when Time/Div >= 200ms) and repeatedly saves the waveform if the hard disk has enogh memory depth.

- **Quick-Log when press Ctrl-L**

  This is a hot key for logger.

There are two different file types: "*.dsow" and "*.log" for "Logger" .

"*.dsow" is saved in the installation directory QuickSave folder isand is the same file type as the Reference waveform format which works for "Interval" or "Every Trigger" and can be retrieved from "Save/Recall" function. If there are many "*.dsow" files need to be retrieved, "Waveform Viewer/Waveform Album", a viewer program should be used to browse the "*.dsow" files at the same window.. "*.log" works for "Every Sampling" and can only be retrieved in "Import data" function.

e. Export data

"Export data" exports the waveform with its setups parameters like Time/Div, Volt/Div, Channel number and Threshold. The waveform information can be exported in different formats like print out, preview, Word, Excel, text or clipboard.

f. Import data

"Import data" imports the waveform with its setup parameters. The import waveform can be in different formats like print out, preview, Word, Excel, text or clipboard.

g. Page Select

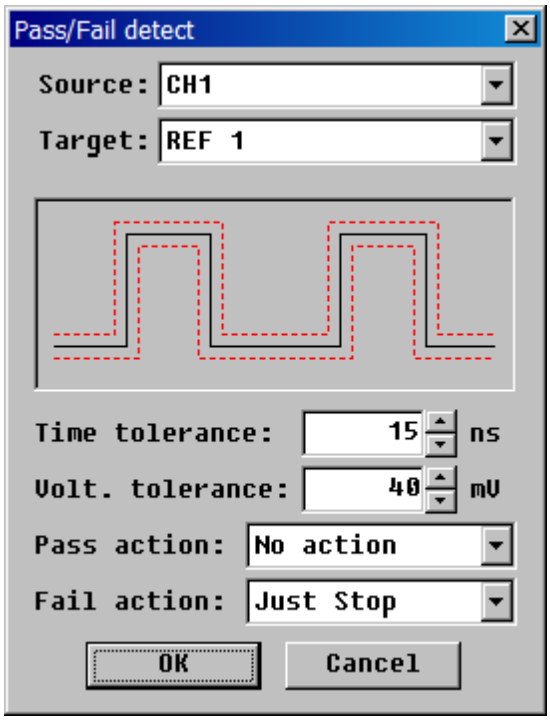
It shows the rest of sub functions in "Utility".

h. Product Information

It contains information regarding the DSO hardware, software, firmware and production date which are useful in technical support.

i. Pass/Fail Setting

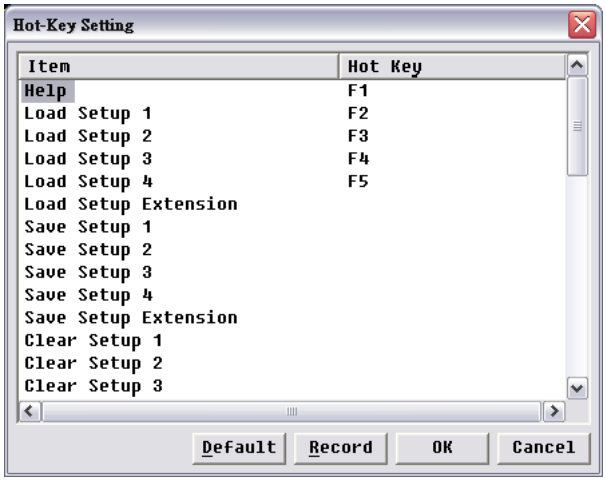
"Pass/Fail" ("Go/No Go") is for auto-test purpose. Use a waveform as reference and set the tolerance range of time and voltage to create a waveform "tunnel", then any waveform is (not) able to goes through the "tunnel" is "Pass" ("Fail"). Setting procedure is as below:



- Use "Save/Recall" to show the reference waveform (see "Save/Recall" section).
- Enter "Pass/Fail" dialog box.
- Input benchmark tolerance levels for time and voltage.
- Set action for "Pass" or "Fail". Sometimes, too many untrue "Fail" events may happen due to unstable (noise) waveforms. You may use the "Average" function or turns on the 20MHz bandwidth limit to filter the unexpected noises.

j. Hot Key Setting

"Hot Key Setting" is for the production line workers who need to operate the DSO for production purpose. In the "Hot-Key Setting" dialogue box, you may create "Hot Key" with function(s) or sub-function(s) in "define" list or you can delete "Hot Key" be pressing "Escape". Please be noted that not any function key can be defined as "Hot Key".

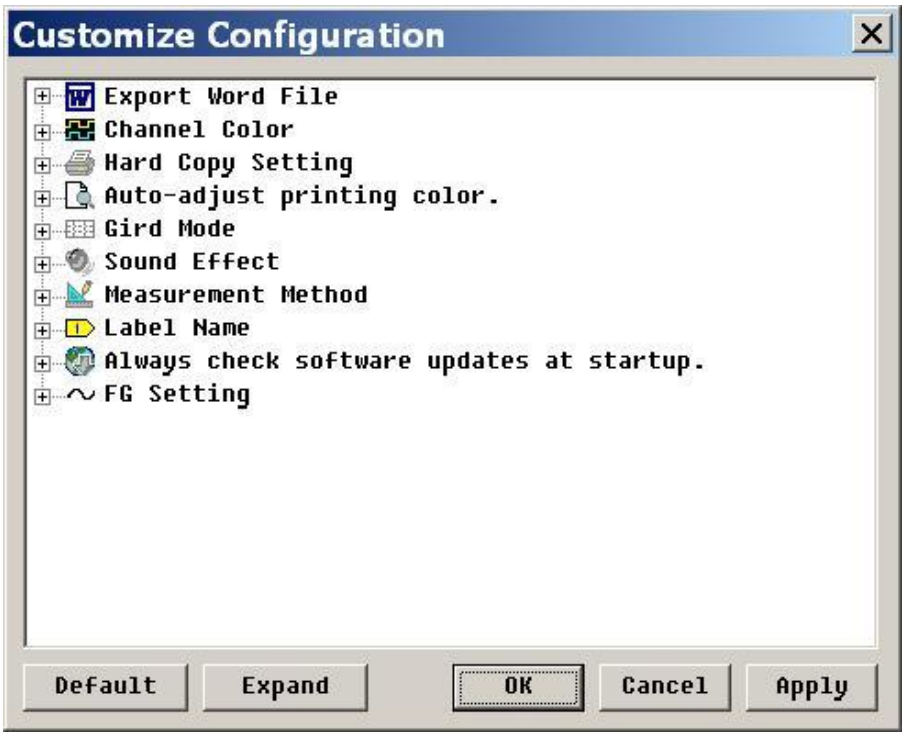


k. Online Update

The DSO supports online software update.

l. Customize Configuration

Set the DSOenvironments like “Channel Color”, “Grid Mode” or “FG setting” etc.



- **Export Word File**

  Set the background color (white/black) for the exported Word file.

- **Channel Color**

  Set the channel color

- **Har Copy Setting**

  Set the background color (white/black/auto-adjust) for the printed waveform.

- **Auto-Adjust printing color**

  Set the background color (white/black/auto-adjust) for the printed waveform.

- **Grid Mode**

  There are three types: Dot line, Solid Line or Hide Grid.

- **Sound Effect**

  Beep when the trigger succeeds.

- **Measurement Method**

  There are three types: smart method, mean voltage, and threshold voltage.

- **Label Name**

  Enter the channel name.

- **Always check software updates at startup**

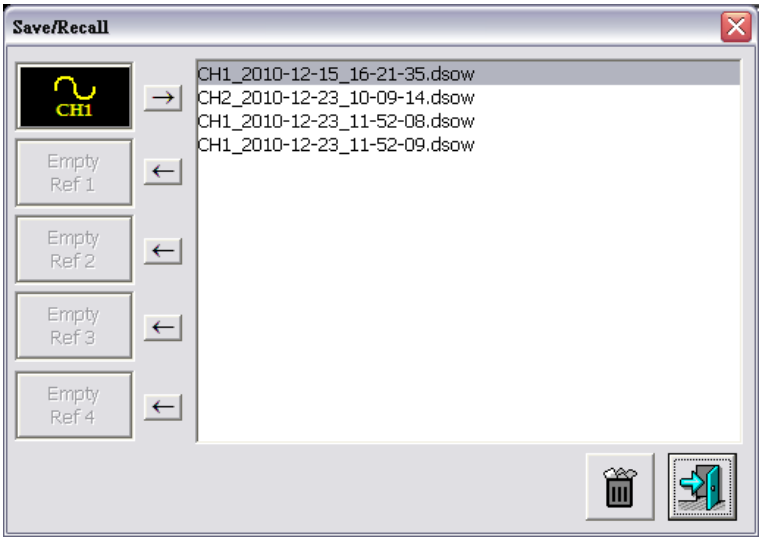
  Check if there is any newer version software for online upgrade.

- **FG Setting**

  The FG will generate square waveform or the type of waveform set in last time.

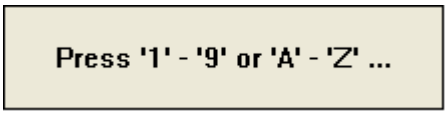
(10) Save/Recall

"Save/Recall" saves/recalls the waveform into/from a file or save/recall/delete the "Setup" keys.



You may save many waveforms into files (as the figure above), but only up to four waveforms can be recalled to be the reference waveforms at the same time.

"Save/Recall" can also be used to set up parameters like "Time/Div", "Volt/Div", "Ground Offset", Threshold or "Focus Channel", … etc. in the four "Setup" keys (hot keys). There are four "Setup"s with their own time tag on the software window (see the figure on the right top), but 35 more can be set up in "Hot Key Setting", "Export data" or "Import data".



An easy way is to set F7 as the "Save Setup Extension" key in the "Hot Key Setting", F8 as "Load Setup Extension" and F9 as "Clear Setup Extension", then you can press F7 to save your setup with 35 choices (1, 2, …,9, A, B,…, Z) to store it, press F8 to load your setup(s) or press F9 to clear the setups.

(11) Acquire

a. Acquire

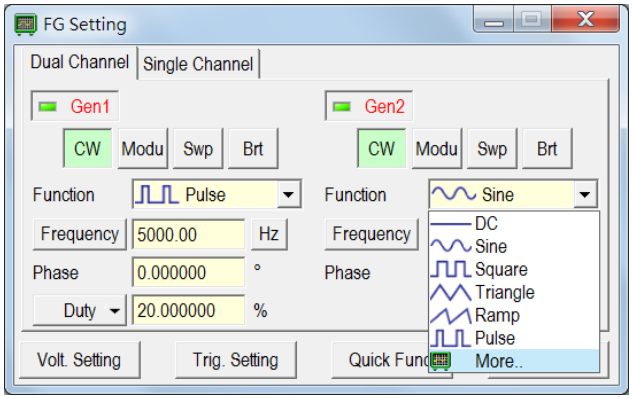
- Sample: Create a waveform by saving one sample point during each waveform interval.
- Equivalent Time Sample: records repeated waveforms and forms them to display a fine shape waveform. If Time/Div setup is > 500ns, the DS-1000 automatically switches to “Sample” because it can display a fine shape waveform with 500ns per grid.
- Average: Like Sample, except waveform points from consecutive acquisitons are averaged together to produce the final displayed waveform.
- Peak Detect: Save the minimum and maximum value sample points taken during two waveform intervals and uses these samples as the two corresponding waeform points.
- Envelope: Similar to Peak Detect, except the minimum and maximum waveform points rom multiple acquisitions are combined to form a waveform that shows min/max accumulation over time.
- Hi-Res: Multiple samples taken within one waveform interval are averaged together to produce one waveform point to have a decrease in noise and an improvement in resolution for low-speed signals.

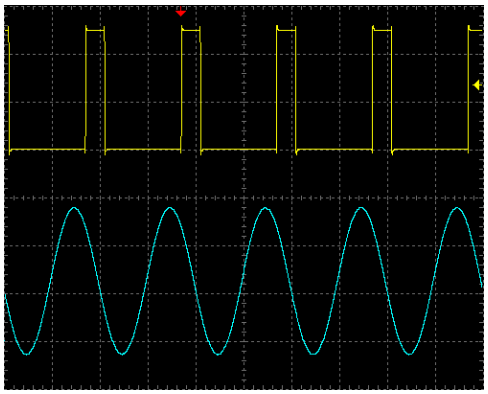
b. Roll Mode

The waveform will not be refreshed but be rolled. The DS-1000 series sampling rate is less than 1KS/s. and the TravelScope series sampling rate is less than 5KS/s.

c. FG Setting

The TravelScope has a two-channels (Gen1, Gen2) embedded function generator that generates specific signal input by the mouse wheel or keyboard.





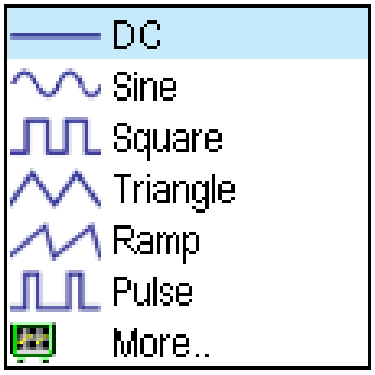
Dual/Single Channel:

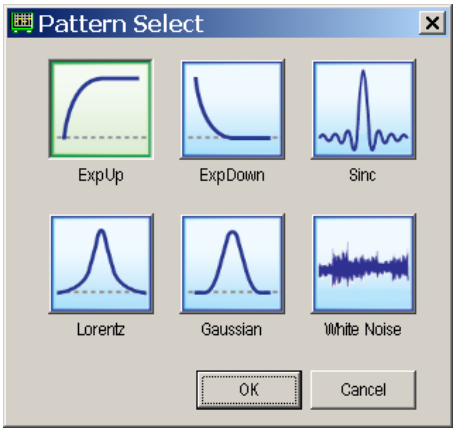
Dual Channel: Gen1 and Gen2 voltage output range is 0 ~ 2.5 V.

Single Channel: Gen1 disabled, Gen2 voltage output range is -2.5 ~ 2.5 V.

Gen1/Gen2 button: Enable or disable the output.

- Function: Select the signal pattern.





- **CW (Continuous Waveform):**

  Transmit the signal continuously.

- **Modu (Modulation):**

  Generate the analog and digital modulation signal.

- **Swp (Sweep):**

  Vary the frequency of a signal over a specified time period.

  Mode:

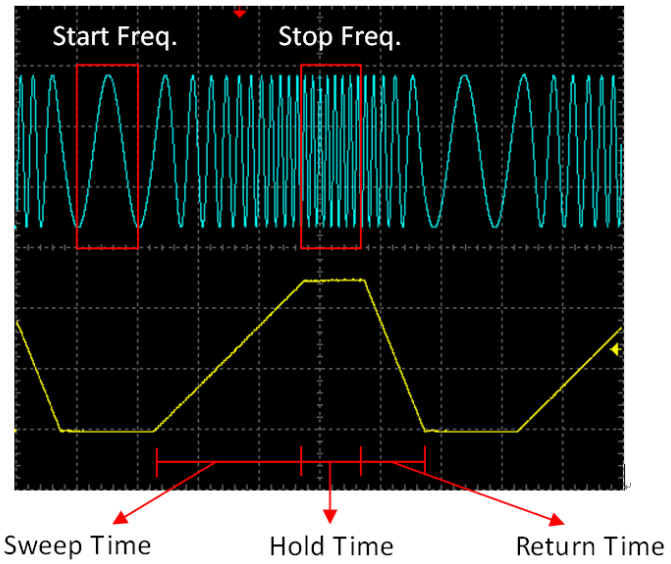
  Repeat Mode: Repeatly sweep signals.

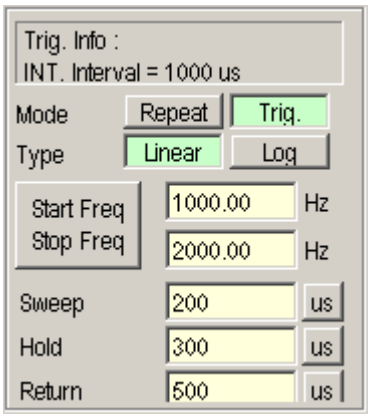
Trig. Mode: Sweep a signal after trigger.

Type:

Linear: Sweep a signal in linear frequency.

Log: Sweep a signal in exponential frequency.

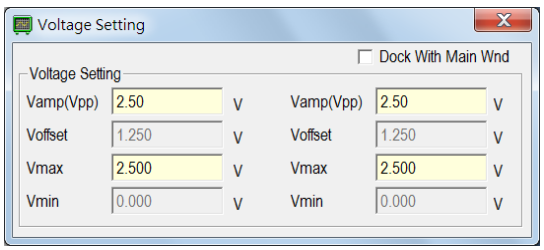




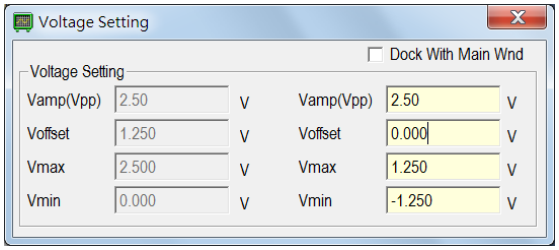
- **Brt (Burst):**

Send Burst signal from time to time.

Voltage Setting:



(Dual Channel Mode)



(Single Channel Mode)

Trigger Setting:

Trig. Source: Internal or external trigger source which depends on “Swp” and “Brt”.

Quick Func.:

Save and load the preset waveform.

Sync.:

Synchronize the two channels (Gen1, Gen2).

(12) Autoset

The DSO offers autoset function “AUTOSET” to automatically adjust the voltage, time and trigger parameters to test and measure signal and display the waveform more quickly. “AUTOSET” button, when pushed, will find the parameters of the channel being activated. For example, if the “Channel Switch” button is on CH1, then, the Volt, Time, and Trigger of CH1 signal will be benchmark parameters for “AUTOSET” function.

Chapter 4 How to stack DSOs

4.1 How to stack DSOs

You can stack 2/3 sets of the DSOs as a 4/6 channels oscilloscope. Use the stack (MCX-MCX) cable to connect the Trigger Output of the master DSO to the Trigger Input of the second (slave) DSO and the same for the second DSO to the third (slave) DSO as shown below. The stack dialogue box displays the serial numbers of the stacked DSOs; CH1, CH2 have been assigned to the master DSO, and CH3, CH4/CH5, CH6 to the 2nd/3rd DSO.

Limitations in the stack mode:

DS-1000 Series	
Mode	"Equivalent Time Sampling" or "Roll Mode" is only available for the master DSO.
Sampling Rate	Real time sampling: the same as an individual unit. Equivalent time sampling: only available for the master DSO.
Time Base Range	5ns/DIV to 100ms/DIV (1-2-5 step) is available for all DSOs. 200ms/DIV to 10s/DIV (Roll mode) is only available for the master DSO.
Trigger source	CH1, CH2 or Ex-Trig is only available for the master DSO.
Jitter	+/- 200ps is available for the master DSO; +/- 10ns for the slave DS-1000(s).

TravelScope Series	
Sample rate	Maximum sample rate is 1GS/s for each 1 channel used for each DSO.
Trigger mode	No pulse width/Video trigger for slave DSOs
Trigger source	CH1，CH2，Ext-Trig (only master)
Skew between devices	±8ns between master and slave DSOs.
Other	When different TravelScope models are stacked, only those TS2202 functions are available.

4.2 APPENDIX

4.2.1 Index

Auto mode	The waveform will be refreshed all times no matter triggers occur or time-out.
Normal mode	The waveform will be refreshed every time trigger occurs.
Single-Shot mode	The waveform will be refreshed the first time trigger occurs.
Roll mode	The waveform will not be refreshed but be rolled if TIME/DIV > 200ms.
Vpp	Peak to peak voltage.
Vrms	Root-mean square voltage.
TV One Field	Trigger the video composite pattern in every field.
TV Odd Field	Trigger the video composite pattern in the odd field.
TV Even Field	Trigger the video composite pattern in the even field.
TV Scan Line	Trigger the video composite pattern at any scan line.

4.2.2 Probe Specification

	Position X 1	**Position X 10**
Attenuation Ratio	1:1	10:1
Bandwidth	DC to 6MHz	DC to 250MHz
Rise Time	58ns	1.4ns
Input Resistance	1M Ohm	10M Ohm when used with oscilloscope with 1M Ohm input
Input Capacitance	47pF plus oscilloscope capacitance	Approx. 17pF

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