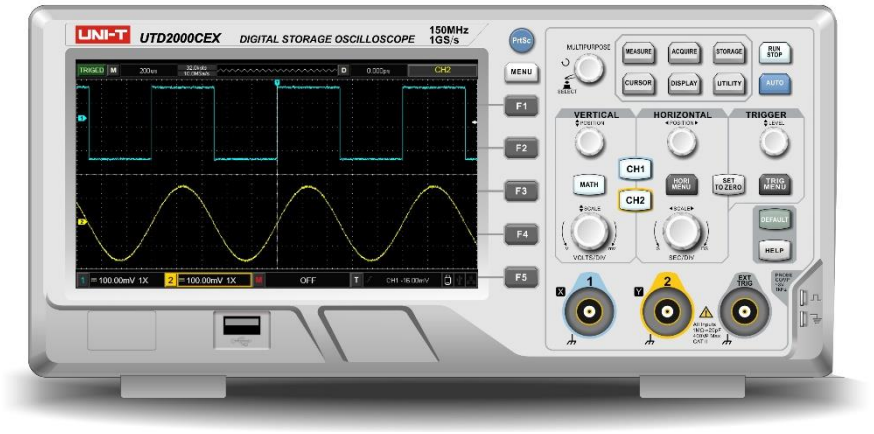
EN: This Datasheet/Document is presented by the manufacturer.

Please visit our website for pricing and availability at www.hestore.hu.

UTD2000 Series

Digital Oscilloscope

User Manual



www.uni-trend.com.cn

Preface

Dear custumer,

Thank you for choosing this UNI-T device. In order to safely and correctly use this instrument .please read this manual thoroughly, especially the Safety Notes part. After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

Copyright and Declaration

Copyright Information

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Trademark Information

UNI-T is the registered trademark of Uni-Trend Technology (China) Co., Ltd.

Document Version

UTD2000 -20210816-V3.00

Statement

- UNI-T products are protected by patent rights in China and other countries, including issued and pending patents.
- UNI-T reserves the rights to any product specification and pricing changes.
- UNI-T reserves all rights. Licensed software products are properties of Uni-Trend and its subsidiaries or suppliers, which are protected by national copyright laws and international treaty provisions.

Information in this manual supercedes all previously published versions.

If this product is sold or assigned by the original purchaser to a third party within three years of purchase, the new owner should note that warranty is available for a period of three years from the day the original purchaser acquired the product from Uni-T or an authorized dealer. The probe, other accessories and fuses are not covered by warranty.

If any genuine defect is found during the valid warranty period, Uni-T has the option to repair the defective product without any charge for parts or labor, or replace it with another product (at the discretion of Uni-T). Uni-T may use parts, modules and replacement products that are brand new or repaired to a good-as-new standard. All old parts, modules and products that are removed during replacement become properties of Uni-T.

In this User Manual, “customer” means an individual or entity vested with the rights hereunder. To enjoy the warranty service, the “customer” must report any defect to Uni-T during the valid warranty period and make appropriate arrangement to allow servicing. The customer should pack the defective product in a container and deliver it to a maintenance centre specified by Uni-T. The customer should also prepay all freight cost and provide a copy of the original sales receipt issued to the original purchaser. If the product is to be delivered to an address within the country where the maintenance centre operates, Uni-T shall pay the cost of returning the product to the destination, all freight, custom duty, tax and other costs will be paid by the customer.

This warranty shall not apply to any defects or damages caused by accidental, machine parts’ wear and tear, improper use, and improper or lack of maintenance. UNI-T under the provisions of this warranty has no obligation to provide the following services:

a) Any repair damage caused by the installation, repair, or maintenance of the product by non UNI-T service representatives.

b) Any repair damage caused by improper use or connection to an incompatible device.

c) Any damage or malfunction caused by the use of a power source that does not conform to the requirements of this manual.

d) Any maintenance on altered or integrated products (if such alteration or integration leads to an increase in time or difficulty of product maintenance).

This warranty written by UNI-T for this product, and it is used to substitute any other express or implied warranties. UNI-T and its distributors do not offer any implied warranties for merchantability or applicability purposes.

For violation of this guarantee, UNI-T is responsible for the repair or replacement of defective products is the only remedy available to customers. Regardless of whether UNI-T and its distributors are informed that any indirect, special, incidental, or consequential damage may occur, UNI-T and its distributors shall not be responsible for any of the damages.

General Safety Overview

This instrument strictly complies with the safety requirements for electronic measuring instrument IEC 61010-1 safety standard during design and manufacturing. Please understand the following safety preventative measures, to avoid personal injury, and to prevent damage to the product or any connected products. To avoid possible dangers, be sure to use this product in accordance with the regulations. If the equipment is used in a manner not specified by manufacturer, the protection provided by the equipment may be impaired

- Only trained personnel can perform the maintenance program.
- Avoid fire and personal injury:
- Use the correct power line: Only use the dedicated UNI-T power supply appointed to the local region or country for this product. The rating shall not be lower than the rating requirements.

Mains supply cord set specification			
Applicable area	Type	Rating	Standard
For EU	Plug	AC 250V, 10A	IEC 60779
	Cord	3X0.75mm², 300V,105°C	
	Connector	AC 250V, 10A	
For US and CAN	Plug	AC 125V,10A	UL 498
	Cord	3X18AWG, 300V,105°C	
	Connector	AC 125V,10A	

- Correct Plug: Don't plug when the probe or test wire is connected to the voltage source.
- Ground the product: This product is grounded through the power supply ground wire. To avoid electric shock, grounding conductors must be connected to the ground. Please be sure that the product is properly grounded before connecting to the input or output of the product. Safety considerations, When measuring dangerous voltage, wear protective equipment, such as insulating gloves, and keep away from others.
- Correct connection of oscilloscope probe: Ensure that the probe ground and ground potential are correctly connected. Do not connect ground wire to high voltage. Must use impedance not less than 1 MΩ Probe.
- Check all terminal ratings: To avoid fire and the large current charge, please check all the ratings and the marks on the product. Please also refer to the product manual for details on the ratings before connecting to the product. Do not use beyond the range.
- Do not open the case cover or front panel during operation.
- Only use fuses with ratings listed in the technical index.
- Avoid circuit exposure: Do not touch exposed connectors and components after power

is connected.

- Do not operate the product if you suspect it is faulty, and please contact UNI-T authorized service personnel for inspection. Any maintenance, adjustment, or replacement of parts must be performed by UNI-T authorized maintenance personnel.
- Instructions not to position the equipment so that it is difficult to operate the disconnecting device
- Maintain proper ventilation.
- Do not used to measure MAINS CIRCUIT.
- Before each use verify tester operation by measuring a known voltage.
- Please do not operate the product in humid conditions.
- Please do not operate in inflammable and explosive environment.
- Please keep the product surface clean and dry

Radio frequency magnetic field:

CS: The product was tested per EN 61000-4-6, interference signal amplitude is 3V, frequency is beween 150kHz to 80MHz. The waveform will be affected with interference signal, and return to normal after removing it.

RS: The product was tested per EN 61000-4-3，interference signal is under below situation: 1、Amplitude=3V, Frequency is beween 80MHz to 1GHz and 1.4GHz to 2GHz；2、Amplitude=1V, Frequency is beween 2GHz to 2.7GHz; The waveform will be affected with interference signal, and return to normal after removing it.

Safety Terms and Symbols

The following terms may appear in this manual:

Warning: The conditions and behaviors may endanger life.

Note: The conditions and behaviors may cause damage to the product and other properties.

The following terms may appear on the product:

Danger: Performing this operation may cause immediate damage to the operator.

Warning: This operation may cause potential damage to the operator.

Note: This operation may cause damage to the product and devices connected to the product.

The following symbols may appear on the product:

Symbol	Description
	Direct current
	Alternating current
	Earth (ground) TERMINAL
	PROTECTIVE CONDUCTOR TERMINAL
	Caution, possibility of electric shock
	Warning or Caution
	Frame or chassis TERMINAL
	Comply with European Union standards
	Conforms to UL STD 61010-1, 61010-2-030, Certified to CSA STD C22.2 No. 61010-1, 61010-2-030.
	Do not place equipment and its accessories in the trash. Items must be properly disposed of in accordance with local regulations.

Preface

The Manual introduces information related to operation of digital storage oscilloscope of UTD2000 series user manual. The Manual comprises the following chapters:

Chapter 1 Introduction Guide
Chapter 2 Vertical channel setting
Chapter 3 Horizontal system setting
Chapter 4 Trigger system setting
Chapter 5 Sampling system setting
Chapter 6 Display system setting
Chapter 7 Automatic measurement
Chapter 8 Cursor measurement
Chapter 9 Storage and callback
Chapter 10 Auxiliary function setting
Chapter 11 Other function keys
Chapter 12 Applicaion example
Chapter 13 System prompt and troubleshooting
Chapter 14 Technical specification
Chapter 15 Appendix

UTD2000 Series Digital Storage Oscilloscope contains the following 9 models:

Series	Model	Band Width	Sampling Rate
UTD2000	UTD2052CL+	50MHz	500MS/s
	UTD2072CL	70MHz	500MS/s
	UTD2102CL+	100MHz	500MS/s
	UTD2102CL PRO	100MHz	500MS/s
	UTD2152CL	150MHz	500MS/s
	UTD2102CEX+	100MHz	1GS/s
	UTD2152CEX	150MHz	1GS/s
	UTD2202 PRO	200MHz	1GS/s
	UTD2202CEX+	200MHz	1GS/s

UTD2000 series provide the users with front panels with simple operation and clear functions to perform all the basic operations. Scale and position knobs of each channel provide visual operations that are suitable for user habits as the traditional instrument. Users may be able to master it without spending plenty of time learning and understanding operations of any UTD2000 series DSO. In order to accelerate adjustment and facilitate measurement, the users can directly press AUTO key and the instrument will then display applicable waveform and gear position settings.

Apart from easy to use, UTD2000 series DSO also has high performance indexes and

powerful functions required for faster completion of measurement tasks. User can observe faster signals on UTD200 series DSO by high-speed real time sampling and equivalent sampling. Clear LCD and mathematical operation functions make it easier for users to observe and analyze signal problems in a faster and clearer way.

From the following parameter features, you can understand how this series of DSO can satisfy your measurement requirements.

- Two analog channels.
- High resolution LCD display 800×480 resolution.
- Support plug and play USB storage equipment or be capable of communicating with computer via USB storage equipment.
- Automatic waveform and state settings
- Waveform saving and replay feature
- Delicate window extension function and precise analysis on waveform details and overview
- Automatic measurement of 34 waveform parameters
- Automatic cursor tracking measurement function
- Unique functions of waveform recording and playback.
- Built-in FFT software function
- Multi-waveform mathematical operation function (including: addition, subtraction, multiplication and division)
- Edge, Video, Slope, Pulse width, Alternating trigger and other functions
- Multi-language menu selection
- Help Information in Mutil-language.

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Chapter I Introduction

This chapter introduces what users should pay attention to, front & rear panels, user interface and instruction of built-in system when using UTD 2000 series DSO first time.

1.1 General Inspection

After purchasing a new UTD2000 DSO, we recommend you to inspect the instrument according to the following steps.

(1) Inspect whether there are damages caused by transportation

In case of severe damages to packing box or foamed plastic mat, you should replace immediately.

(2) Accessories inspection

For provided accessories details, description has been made in annex A “Accessories” of this user manual. Please check whether there are shortages in the accessories. If you found shortage or damages of accessories, please contact the UNI-T distributors distributing the product or local offices of UNI-T.

(3) Check the complete instrument

In case of damages to the appearance of instrument, abnormal operation or failure to pass the performance tests, please contact the UNI-T product distributors or local UNI-T offices.

If the instrument is damaged due to transportation, please pay attention to keeping the package, notify transportation department and UNI-T product distributors and UNI-T will make arrangement for repair or replacement.

1.2 Function Inspection

Conduct a fast function inspection to verify whether the instrument is in normal operation. Please take the steps as follows:

(1) Power on:

The power supply voltage range is from 100 VAC to 240 VAC, the frequency range is 50/60Hz. Connect the oscilloscope to the power supply line that comes with the oscilloscope or any power supply line that meets the host country standards. Press the power switch button  on the top of the oscilloscope.

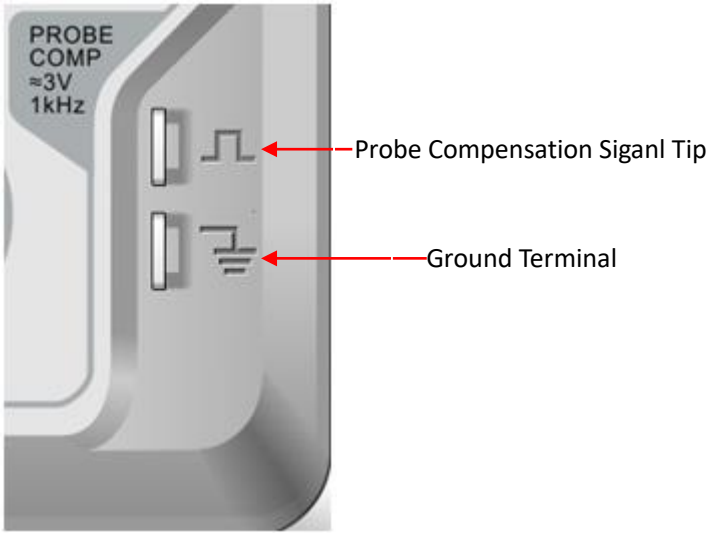
(2) Switch on the instrument and Check:

Press the power switch button , the oscilloscope then will show a boot animation, and it will enter the normal interface afterwards.

(3) DSO accessing to signal

Connect the probe BNC terminal to the BNC of channel 1 of DSO, connect the probe to “Probe Compensation Signal Tip”, connect the alligator clip of probe to the “Ground Terminal”. The output of the probe compensation signal tip is: the range is about 3Vpp, the

frequency defaults at 1kHz.



(4) Function Check

Press AUTO (auto setting) button, square wave appears on the display screen, the wave range is about 3Vpp and the frequency is 1kHz. Go back to step 3 and check other channels in a same way. If the actual displayed waveform is different from above figure, please go to next step “Probe Compensation”.

(5) Probe Compensation

When connecting the probe with any input channel for the first time, it is required to make adjustment for this item, matching the probe with input channel. Probe without being compensated and corrected will lead to measurement error or mistake. In case of adjustment of probe compensation, follow the following steps:

- Set the probe menu attenuation coefficient as 10×, place the switch on the probe at 10× and connect DSO probe with CH1. If hook-shape head of probe is used, please make sure that it contacts the probe. Connect the probe to the probe compensator of DSO, connect the grounding clamp to the “Grounding terminal” of probe compensator, turn on CH1 and press AUTO.
- Observe displayed waveform

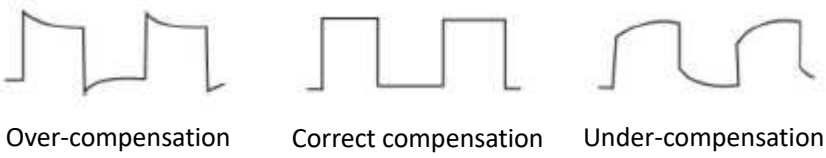


Figure 1-5 Probe Compensation and Correction

- If screen displays “under-compensation” or “over-compensation” for waveform as shown in above figures, use screwdriver with nonmetal handle to adjust the variable capacitance on the probe until screen displays “correct compensation” for waveform as shown in the above figure.

Warning: In order to avoid electric shock when measuring high voltage with probe, please ensure that the insulation lead of the probe is in good condition and do not contact the metal part of the probe when connecting high pressure power supply.

1.3 Front and Rear Panel

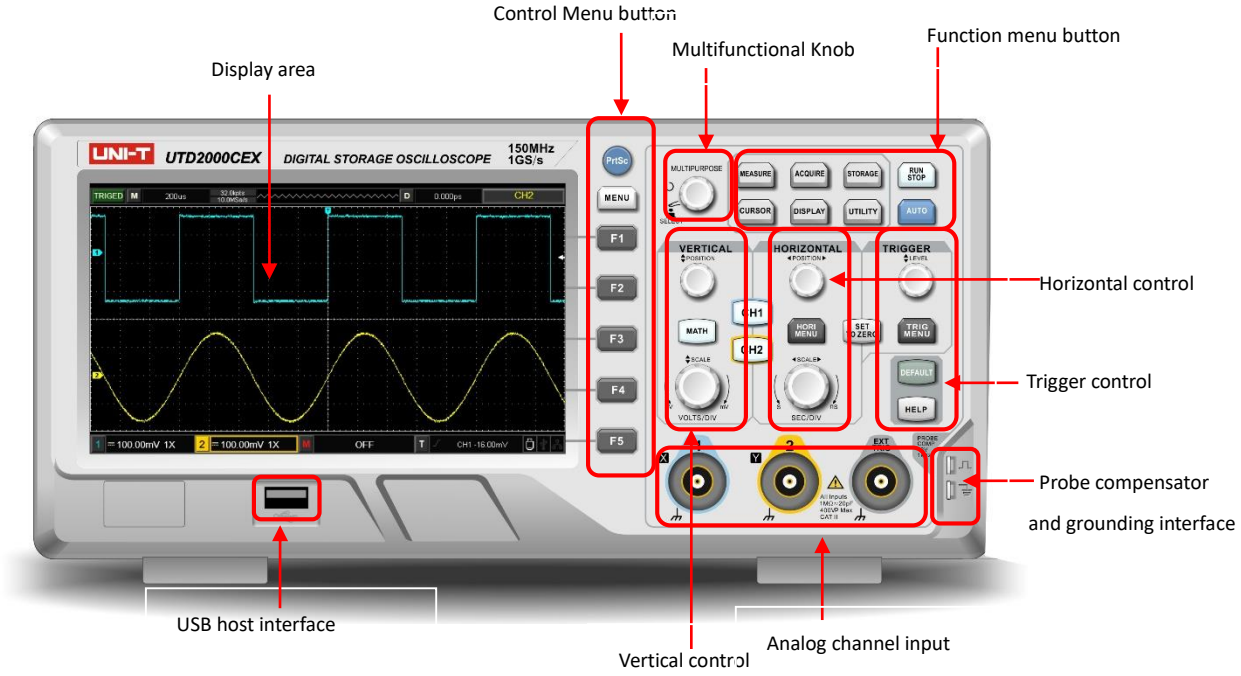


Figure 1-3 Front Panel

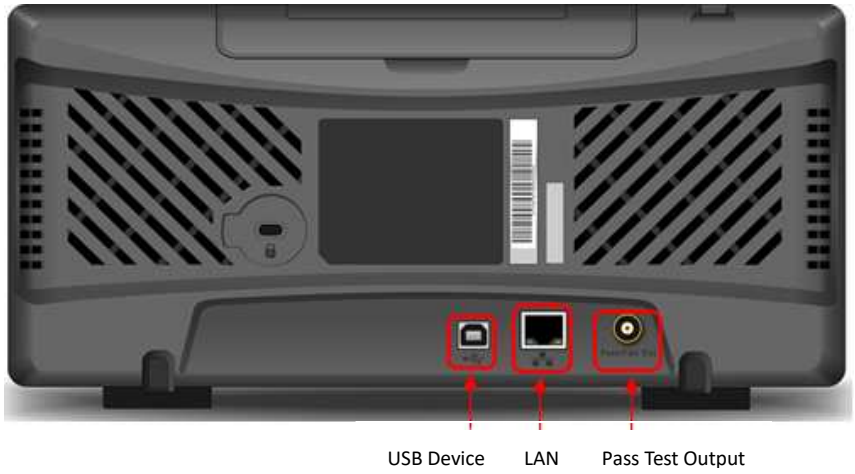
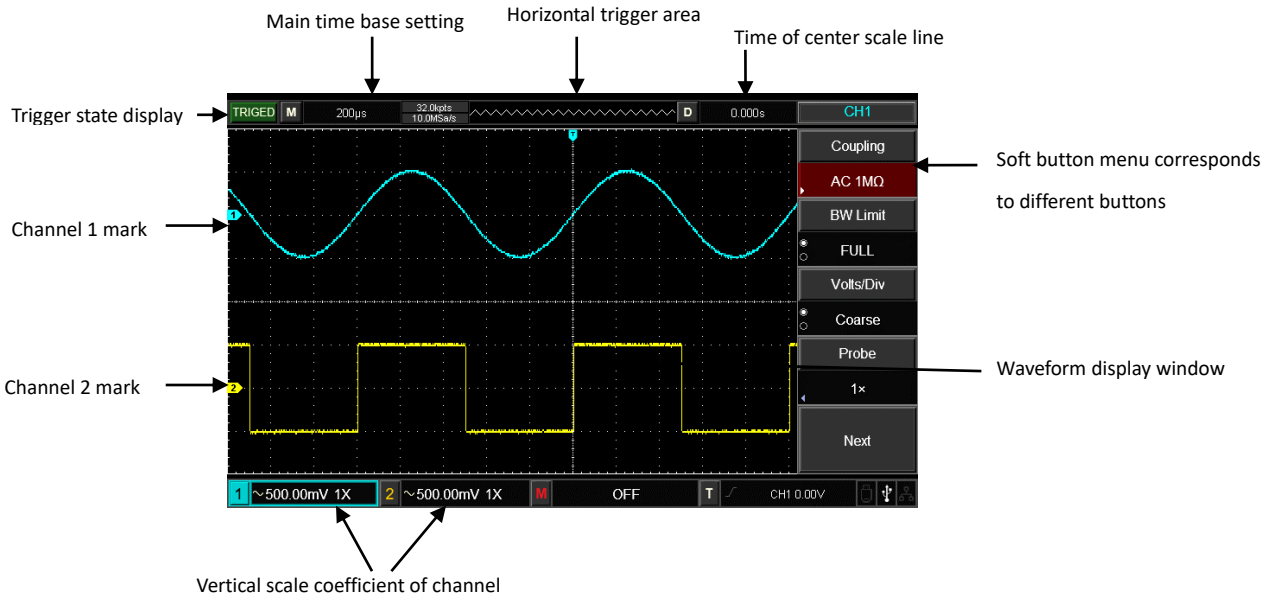


Figure 1-4 Rear Panel

1.4 Display

(1) Display description



(2) Soft button

Press any soft button to activate corresponding menu. Symbols below may display on the menu:

: There is next menu.

: There is dropdown memu.

: The menu has two options.

: User can adjust by multifunctional knob.

: Press this menu to pop up virtual digital keypad.

1.4 Automatic Settings of Waveform Display

UTD2000 series DSO has automatic setting function. According to input signals, automatically adjust the vertical deflection factor, scanning time base and trigger mode until the most appropriate waveform is displayed. For automatic setting application, the frequency of the measured signal is required to be ≥ 20Hz.

Apply automatic setting:

(1) Connect measured signal to signal input channel.

(2) Press AUTO key. DSO will automatically set its vertical deflection factor, scanning time base and trigger mode. If further careful observation is required, adjustment can be conducted again after automatic settings until the waveform display reaches required optimum effect.

1.5 Introduction to the Vertical System

As shown in the figure below, there are a series of keys and knobs in the vertical

control area. Practices below will gradually guide you to get familiar with the controlling of the vertical system.



Figure 1-6 Vertical Control Area on the Panel

(1) Vertical POSITION: vertical position knob, user can change the current vertical position of channel waveform, the vertical position value 240.00mV will display on the baseline cursor area. Press this knob to get the dispayed channel position back to the vertical center.

If the coupling mode of channel is DC, user can fast measure the DC component of signal by observing the difference between waveform and signal ground.

If the coupling mode of channel is AC, the DC component in the signal will be filtered, which helps to display AC component of signal with higher sensitivity.

(2) Vertical SCALE: Change vertical setting and observe the change of status information. User can confirm any change of vertical scale level by the information displayed on the status bar. Rotate the vertical scale knob to change the vertical scale level of "VOLTS/DIV", and then the scale level of channel on the stauts bar will be changed accordingly. Press CH1, CH2, MATH to display operation menu, symbols, waveform and scale level status of corresponding channels. Double click CH1, CH2, MATH to turn off the channel.

1.6 Introduction to the Horizontal System

As shown in the figure below, there is one key and two knobs within the horizontal control area. Practices below will gradually guide you get familiar with the setting of horizontal time base.



Figure 1-7 Horizontal Control Area on the Panel

1. Use horizontal SCALE knob to change gear position settings of horizontal time base and observe the changes of state information. Turn horizontal SCALE knob to change "SEC/DIV" time base gear position, and you can find that corresponding changes have taken place in the time base gear position display of corresponding channel in the status bar. Horizontal scanning rate steps up in the multiple of 1, 2 and then 5 from 2ns to 50s.

2. Use horizontal POSITION knob to adjust the horizontal position of the signal in the waveform window. Horizontal POSITION knob controls the trigger position of the input signal. When applying to trigger position and turning horizontal POSITION knob, it is possible to observe the horizontal movement of waveform along with POSITION knob turning.

3. Press HORI MENU to enter Zoom menu. On this menu, press F1 to turn on time extension, press F1 again to turn off time extention and go back to main time base. Users can also set trigger holdoff time on this menu.

1.7 Introduction to the Trigger System

As shown in Figure 1-8, there is one knob and four keys in trigger menu control area. Practices below will gradually guide you to be familiar with the setting.



Figure 1-8 Trigger Control Area and Trigger Menu on the Panel

(1) Turn trigger level knob LEVEL to change trigger level. Please refer to the trigger marking on the screen to indicate the trigger level line. The trigger level line should move up/down accordingly. The trigger level value will change accordingly.

(2) Press TRIG MENU to change the trigger setting.

Press F1 to select "Edge" trigger.

Press F2 to select CH1 for "Source".

Press F3 to select AC for "Trigger coupling".

Press F4 to select AUTO for "Trigger mode".

Press F5 to select RISING for "Slope type".

(3) Press SET TO ZERO to set vertical and horizontal position of waveform to zero, then the position of trigger level will be on the vertical center of the range of trigger signal.

(4) Press DEFAULT to display "Factory Setting" window, press SELECT to execute factory setting, press MENU to stop factory setting and close the window.

(5) Press HELP to display "HELP" window, press HELP again to close the window.

Chapter II Vertical System

UTD2000 series DSO provides two analog input channels, each channel has an independent vertical menu. Each channel for UTD2000 series DSO can be set independently through the vertical system menu. After pressing CH1 or CH2 function key, the system shall display function menu of CH1 or CH2 channel. See Table 2-1 below for description.

Table 2-1 Channel Menu (Page 1)

Function Menu	Setting	Description
Coupling	AC	Block the DC component of input signal.
	DC	Pass through DC and AC components of input signal.
	GND	Display grounding level (Input signal is not disconnected).
BW Limit	20MHz	Limit bandwidth to 20MHz to reduce high-frequency component of detected signal.
	Full BW	Turn off bandwidth limit, the DSO runs through full bandwidth.
Volts/Div	Coarse	Set vertical scale of current channel based on 1-2-5 scale.
	Fine	Fine Volts/Div is within the range of coarse Volts/Div setting, set the vertical scale of current channel based on 1% step of current Volts/Div scale.
Probe	0.01× 0.02× ... 100× 1000×	Based on probe attenuation coefficient, you select a value to ensure the consistency of vertical scale reading and actual displayed waveform so that you don't need to calculate by multiplying the probe attenuation coefficient.
Next page	——	Go to next page
Invert	ON	Activate reverse function of waveform. Waveform will be displayed reversely.
	OFF	Waveform is displayed normally.

Table 2-2 Channel Menu (Page 2)

Function Menu	Setting	Description
Invert	OFF	Display normal waveform
	ON	Display waveform invert
Unit	V,A	Display the unit of current channel range
Back to	——	Go back to previous page

2.1 Setting coupling channel

If the measured signal connected to the CH1 channel is a sinusoidal signal containing DC component. If your press F1 to select as AC coupling, to set the CH1 into AC coupling mode. Then the DC component of the measured signal is blocked. Waveform display is shown in figure below.

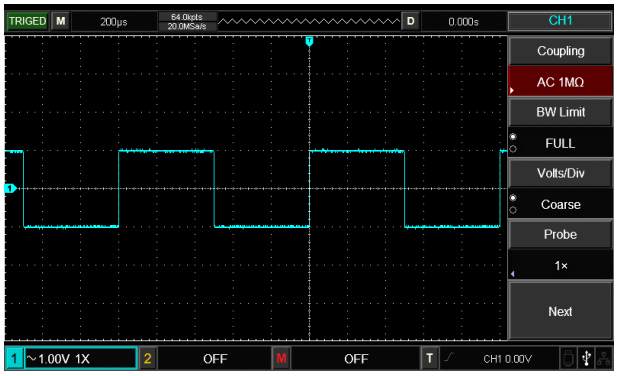


Figure 2-1 Blocked DC Component of Signal

Press F1 to select as DC coupling, you should be able to see both the DC and AC components of measured signals at CH1 channel as shown in figure below.

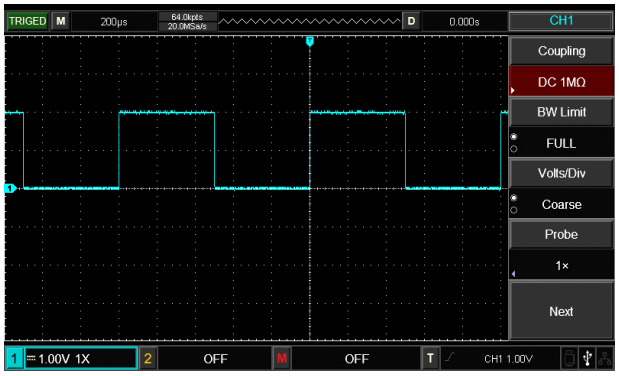


Figure 2-2 Simultaneous Display of Signal DC and AC Components

If you Press F1 to select as GND, to set CH1 to connect to the internal ground of the instrument, both DC and AC components of the input signal are blocked. And, waveform display is shown in figure below.

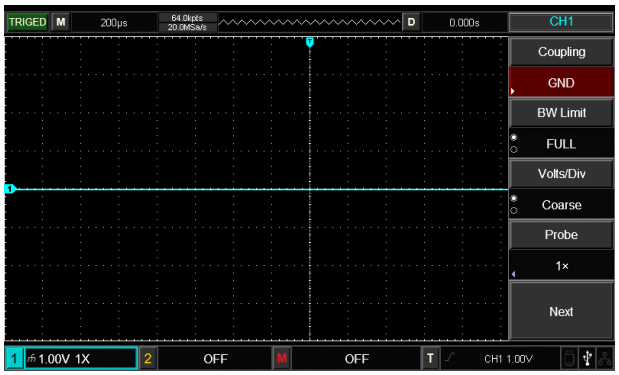


Figure 2-3 Simultaneous Blocking of Signal DC and AC Components

2.2 Setting channel bandwidth Limit

Assuming that the input signal is a 40MHz sinusoidal signal connected to CH1. Press CH1 and then press F2 to set BW Limit as Full Bandwidth, the channel bandwidth becomes full bandwidth, there will be not any bandwidth limited to CH1. And, you can see all the high-frequency component in measured signal as waveform displayed is shown in the figure below.

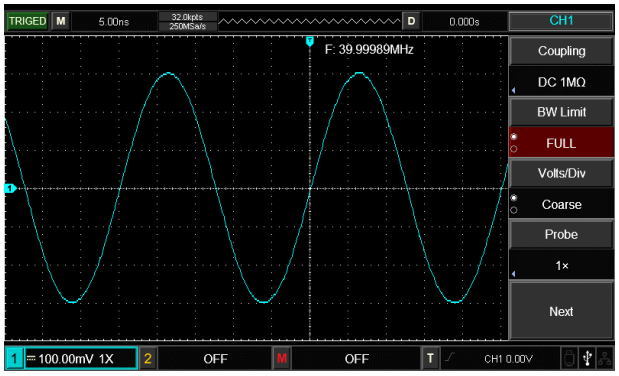


Figure 2-4 Waveform Display When Setting Bandwidth Limit as OFF

Press F2 to set the BW Limit as 20MHz, the noises or high-frequency component over 20MHz in measured signal shall be attenuated, waveform display shown in figure below.

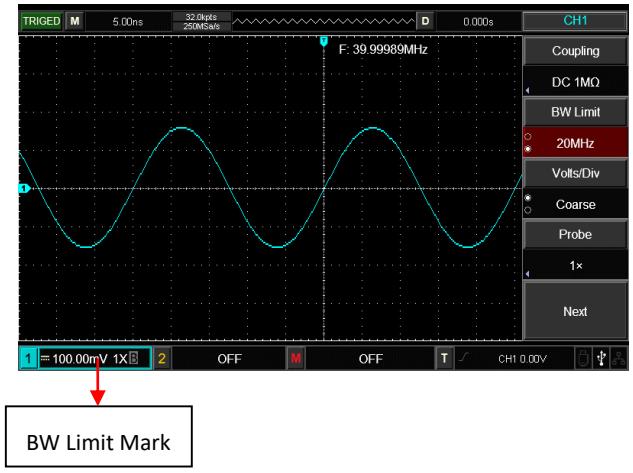


Figure 2-5 Waveform Display When Setting Bandwidth throttling as ON

2.3 Setting probe Rate

In order to cooperate with attenuation coefficient setting of probe, it is required to set the probe attenuation coefficient in channel function menu. If the probe attenuation coefficient is 10:1, the probe coefficient in channel function menu shall be set to be 10× and vice-versa.

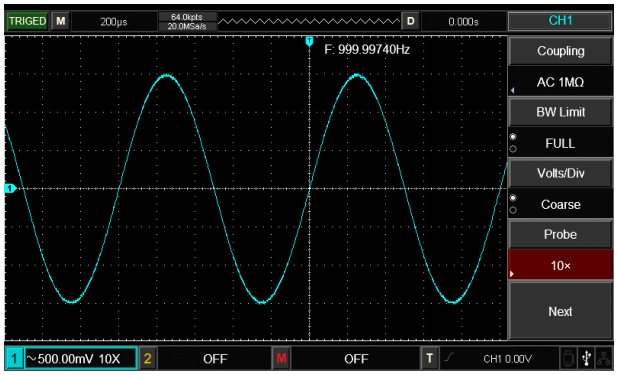


Figure 2-6 Probe Attenuation Coefficient Setting in Channel Menu

2.4 Vertical Volts/Div adjustment setting

Adjustments of vertical deflection factor V/div gear position can be set to coarse adjustment and fine adjustment.

For coarse adjustment, V/div can be adjusted in step of multiple of 1, 2 and 5, the V/div range is 1mV/div～20V/div.

Fine adjustments refer to changing deflection factor with smaller stepping within the current vertical gear position range. Vertical deflection factor can be consecutively adjusted within all vertical gears.

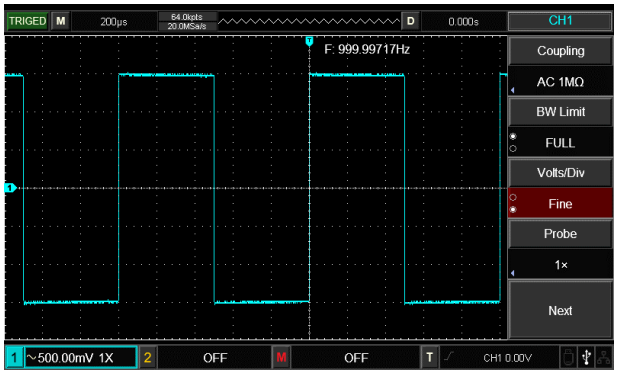


Figure 2-7 Coarse and Fine Adjustment of Vertical Deflection Factors

2.5 Settings of waveform inverting

Waveform inverting can be set by F5 function button. The measured input signal will be displayed with 180 degrees difference. Please see Figure 2-8 for a non-inverted waveform and Figure 2-9 for an inverted waveform.

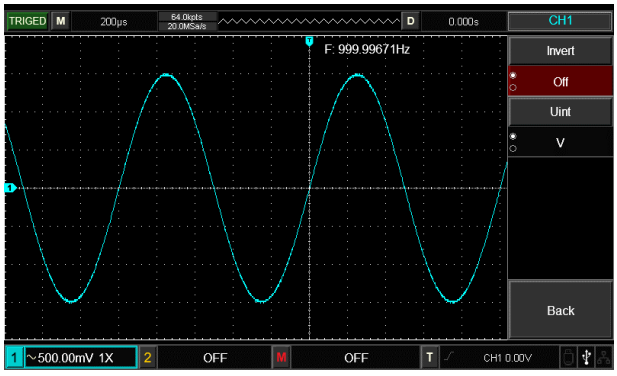


Figure 2-8 Vertical Channel Inverted Settings (Invert: OFF)

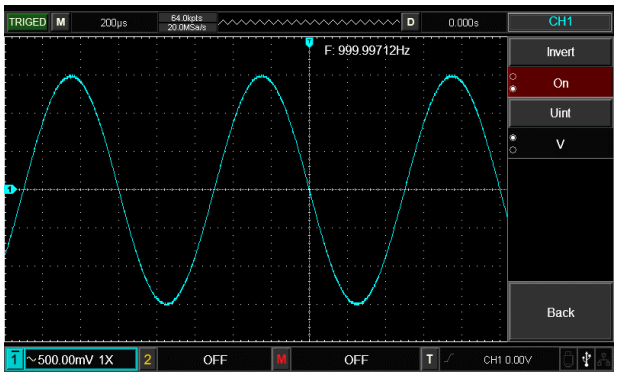


Figure 2-9 Vertical Channel Inverted Settings (Invert: ON)

2.6 Unit

Press UNIT to set the unit as “V” or “A”, the default unit is V. After the unit is set, the unit on channel status tag will change accordingly.

2.7 Mathematical operation function

Display results of CH1 & CH2 waveform mathematic operation (+、−、×、÷).

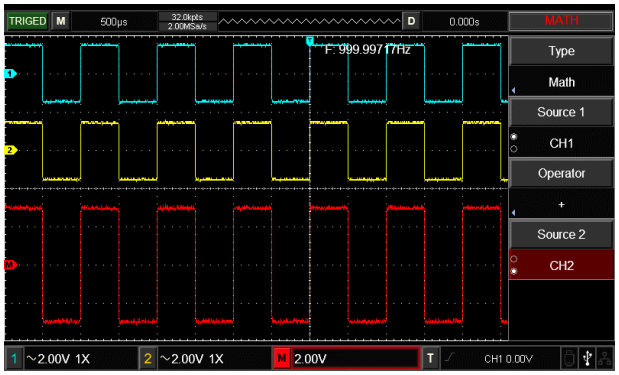


Figure 2-10 Math Operation

Table 2-3：Math Menu

Function Menu	Setting	Description
Type	Math	Mathematic operation (+、−、×、÷)
Source1	CH1	You can select signal source1 as CH1
	CH2	You can select signal source2 as CH2
Operator	+	Source1+Source2
	−	Source1−Source2
	×	Source1×Source2
	÷	Source1÷Source2
Source2	CH1	You can select signal source1 as CH1
	CH2	You can select signal source2 as CH2

2.8 FFT spectral analysis

Enter FFT (fast fourier transform) operation, the time domain (YT) signal can be converted into frequency domain signal. At FFT operation, it is convenient to observe signals of the following types:

- Measure harmonic content and distortion in the system
- Display noise characteristic in DC power supply
- Analyze vibration

Table 2-4：FFT Menu Description

Function Menu	Setting	Description
Type	FFT	FFT mathematical operation
Source	CH1	You can select signal source as

	CH2	CH1 or CH2
Window	Hanning	Set to select Hanning, Hamming, Blackman, or Rectangle window function
	Hamming	
	Blackman	
	Rectangle	
Vertical unit	Vrms	Set vertical units as Vrms or dBVrms
	dBVrms	

Select FFT window

Assuming that YT waveform is continuously repeated, DSO shall conduct FFT conversion for time record with finite length. In this case, when the cycle is an integer, YT waveforms are of the same amplitude at the starting and ending positions, without interrupting. However, if the cycle of YT waveform is not an integer, the waveform amplitudes shall be different at starting and ending positions. Therefore, high-frequency transient interruption shall occur at the joints. In frequency domain, this effect is called leakage. Therefore, in order to avoid the generation of leakage, by multiplying original waveform by a window function, the value at forced starting and ending positions is 0. See the table below for window function application:

Table 2-5：FFT window function

FFT Window	Features	The most suitable measurement content
Rectangle	The best frequency resolution and the worst amplitude resolution. It is basically similar to the condition without window.	Signal levels, before and after transient state or short pulse, are basically equal. Constant amplitude sinusoid with very similar frequency possesses bandwidth random noise with slow spectrum change.
Hanning	Compared with rectangular window, it has better frequency resolution and worse amplitude resolution.	Random noise of sine, cycle and narrow-band.
Hamming	The frequency resolution of Hamming window is slightly superior to Hanning window.	Signal levels, before and after transient state or short pulse, are of large difference.
Blackman	The best amplitude resolution and the worst frequency resolution.	Mainly used for single frequency signal seeking for higher subharmonic.

2.9 Digital Filter

Filter the frequency of specified waveband in signals by adjusting upper/lower frequency limit.

Table 2-6 Digital Fiter Menu

Function menu	Setting	Description
Type	Digital filter	Digital filter
Source	CH1	Set CH1 as operation waveform
	CH2	Set CH2 as operation waveform
Filter type	Low pass	Only when the signal frequency is lower than current upper frequency limit can the signal pass through.
	High pass	Only when the signal frequency is higer than current upper frequency limit can the signal pass through.
	Band pass	Only when the signal frequency is higher than current lower frequency limit and lower than current upper frequency limit can the sigal pass through.
	Band stop	Only when the signal frequency is lower than current lower frequency limit or higher than current upper frequency limit can the sigal pass through.
Lower frequency limit	Lower limit	Adjust lower frequency limit through multifunctional knob, for low pass filter, lower frequency limit is invalid, the menu is hidden.
Upper frequency limit	Upper limit	Adjust lower frequency limit through multifunctional knob, for high pass filter, lower frequency limit is invalid, the menu is hidden.

Chapter III Horizontal System

3.1 Horizontal control



(1) Horizontal control knob

Change the horizontal time-base scale through SCALE knob, changing of horizontal scale can lead to expansion or shrink of waveforms relative to screen center. The horizontal system can be controlled by the following panel buttons/knobs.

Change the horizontal position of waveform on the screen through POSITION, when the horizontal position is changing, the position relative to the waveform trigger point will move right and left.

(2) Horizontal menu button

Press HORI MENU to enter the horizontal menu function. (See table below)

Table 3-1 HORI MENU

Function Menu	Setting	Description
Window extension	On/off	Press to turn on the main time base
Time base selection	Main time base/extensive time base	Main time base: set as main time base, the main time base will change when adjusting horizontal time base. Extension time base: set as extension time base, the extension time base will change when adjusting horizontal time base.
Window extension	——	Press to turn on the extension time base
Hold off time		To adjust the trigger hold-off time by multi-purpose knob

3.2 Explanation of nouns

YT Mode：In this mode, the Y axis represents the amount of voltage, and the X axis represents the amount of time.

XY Mode：In this mode, the X axis represents the CH1 voltage amount, and the Y axis represents the CH2 voltage amount.

Scan Mode：When the horizontal time base control is set at 100ms/div or slower, the instrument enters the slow scan sampling mode. When using the slow scan mode to observe low frequency signals, it is recommended to set the channel coupling to DC.

SEV/DIV：Horizontal scale (time base) units, such as waveform sampling is stopped (using the RUN/STOP button), and the time base control expands or compresses the waveform.

3.3 Window extension

Extension window is used to enlarge the waveform so that users view the image details. The setting of window extension shall not be slower than that of main time base.

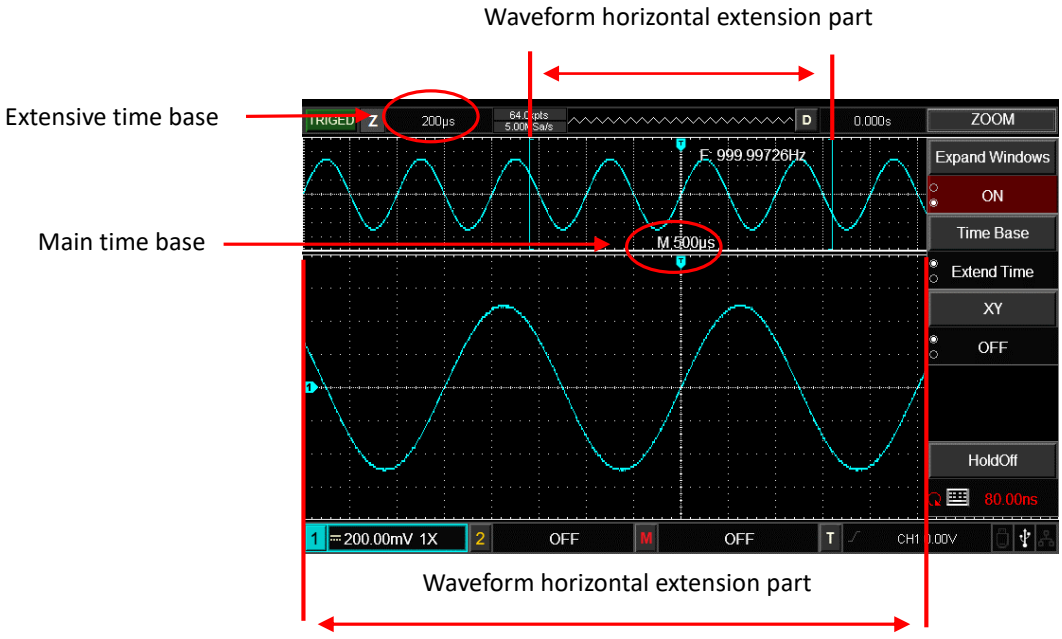


Figure 3-2 Screen Display under Window Extension

Under Window extension time base, there are two display areas, as shown in the figure above. The original waveform is displayed in the upper part, this area can be moved left and right by turning horizontal POSITION knob or can be enlarged and reduced by turning the horizontal SCALE knob.

The lower part is the waveform that has been extended horizontally from selected original waveform area. What users should pay attention is that the extension time base enhances the resolution compared with main time base (as shown in the figure above). Because the displayed lower-part waveform corresponds to the selected upper-part area, so the extension time base can be enhanced by rotating the horizontal SCALE, in other words, it enhances the horizontal extension multiples of waveform.

3.4 XY Mode

XY Mode is also called Lissajous Figure Mode. By using the Lissajous method, users can measure the phase difference of two signals with same frequency. As shown in the figure below:

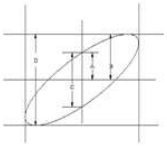


Figure 3-3 Lissajous-Figure

According to sin θ=A/B or C/D, θ is the angle difference of channels, the definition of A, B, C, D is shown in figure above, so the angle difference is: θ=±arcsin (A/B) or θ=±arcsin (C/D). If the elliptical axis lies on I, III quadrant, then the phase difference of angle should lie on I, IV quadrant, that is within (0～π/2) or (3π/2～2π). If the elliptical axis lies on II、IV quadrant, the phase difference of angle should be within (π/2～π) or (π～3π/2). Additonally, users can also figure out the frequency and phase relation between two signals according to Lissajous figures below:

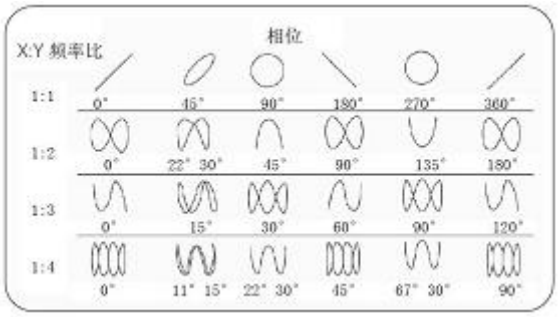


Figure 3-4 Common Lissajous Figures

Only when CH1 and CH2 are used simultaneously can this method be adopted. After selecting XY display mode, CH1 volatage is displayed on horizontal axis and CH2 voltage is displayed on vertical voltage.

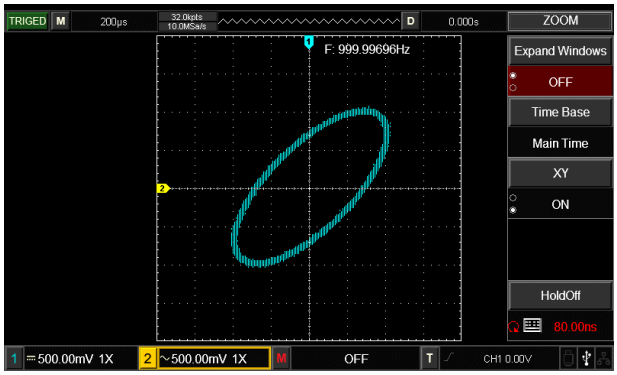


Figure 3-5 Waveform Display under XY Mode

Note: To ensure a better dispay effect of lissajous figures, the waveform display under XY mode has a complete cycle at least. Below functions in XY display mode are ineffective.

- Cursor Measurement Mode
- Reference or Mathematical Operation Waveform
- Window Extension Function
- Trigger Control

Chapter IV Trigger System

When to collect data and display waveform depends on the trigger system. The DSO will convert the unstable displays into meaningful waveform after the trigger is set correctly. When the DSO start collecting data, it will firstly collect enough data to draw a waveform on the left of trigger. DSO will consecutively collect data while it waits the occurrence of trigger condition. After the trigger is detected, DSO consecutively collect enough data to draw a waveform on the left of trigger. The trigger control area of DSO operation panel includes:

LEVEL knob: Trigger level adjustment knob, set the corresponding voltage value of trigger point.

SET TO ZERO: Set the trigger level to the vertical center of trigger signal range.

TRIG MENU: Trigger setting menu button.

Trigger Control

- Trigger Type: Edge, pulse, video, slope and alternating trigger.
- Edge Trigger: When the edge of trigger signal satisfies a certain set level, the trigger starts.
- Pulse Width Trigger: When the pulse width of the trigger signal satisfies a certain set condition, the trigger starts.
- Video Trigger: Conduct field or line trigger for standard video signal.
- Slope Trigger: When the rising/descending slope of signal meets with the set value, the trigger starts.
- Alternating Trigger: CH1 and CH2 trigger their own signals alternatively, applicable to trigger signals without frequency correlation.

4.1 Edge trigger

Edge trigger mode refers to triggering of trigger threshold on the input signal edge. When selecting “edge trigger”, trigger on the rising edge or falling edge of input signal shall be completed.

Table 4-1 Edge trigger menu

Function Menu	Setting	Description
Type	Edge	
Source	CH1	Set CH1 as the triggering signal source.
	CH2	Set CH2 as the triggering signal source.
	EXT	Set external trigger input channel as the triggering signal source.
	AC Line	Set AC power line as trigger source.
Slope	Rising	Set trigger on the signal rising edge.
	Falling	Set trigger on the signal falling edge.
	Rise/fall	Set trigger on the signal both rising and falling edge.

Mode	AUTO	Set to automatic trigger. The DSO will continuously perform data acquisition without triggering signal.
	Normal	Set to normal trigger. The DSO will only perform data acquisition when there is triggering signal.
	Single	Set to single trigger. The DSO will only perform 1 cycle of the data acquisition when there is triggering signal.
Coupling	AC	Block the DC component of triggering signal.
	DC	Pass through DC and AC components of triggering signal
	HF	Reject high-frequency component of the triggering signal (over 80kHz signals).
	LF	Reject low-frequency component of the triggering signal (below 80kHz signals).
	Noise	Reject high-frequency noise, reduce the probability of mis-triggering.

4.2 Pulse width trigger

For pulse width trigger, the trigger time shall be subject to pulse width of the triggering signal. You can capture abnormal pulse by setting pulse width conditions.

Table 4-2 Pulse width trigger menu

Function Menu	**Setting**	**Description**
Type	Pluse	
Source	CH1	Set CH1 as the triggering signal source
	CH2	Set CH2 as the triggering signal source
	EXT	Set external trigger input channel as the triggering signal source
	AC Line	Set AC power line as trigger source
Trigger coupling	AC	Block the DC component of triggering signal.
	DC	Pass through DC and AC components of triggering signal
	HF	Reject high-frequency component of the triggering signal (over 80kHz signals).
	LF	Reject low-frequency component of the triggering signal (below 80kHz signals).
	Noise	Reject high-frequency noise, reduce the probability of mis-triggering.
Trigger mode	AUTO	When there is no signal input, the system will automatically collect waveform data and the scan base line will be displayed on the screen. When there is signal input, the system will automatically switch to trigger scan.
	Normal	Stop collecting data when there is no trigger signal, the system will conduct trigger scan when the trigger signal generates.
	Single	The DSO will only perform 1 cycle of triggering when there is triggering signal.
Pulse width setting		Enter pulse setting menu

Table 4-3 Pulse width setting menu

Function Menu	Setting	Description
Polarity	Positive	Set the positive pulse width as trigger signal
	Negative	Set the negative pulse width as trigger signal
Pulse width condition	>	Trigger when pulse width is greater than the set value
	<	Trigger when pulse width is less than the set value
	<>	Trigger when pulse width is in the range of set value.
Pulse width time		The pulse width is set at 20ns～10s, adjust the time through multifunctional knob on the front panel.
Previous		Go to previous page

4.3 Slope trigger

After the slope trigger is selected, DSO generates a trigger when the rising/descending slope of signal.

Table 4-4 Slope trigger menu

Function Menu	Setting	Description
Type	Slope	
Source	CH1	Set CH1 as trigger signal.
	CH2	Set CH2 as trigger signal.
Trigger coupling	AC HF Noise	Block the DC components of insput signals. Hold off the high-frequency components (over 80kHz) of the signal. Hold off the high-frequency noise of the signal to reduce the probability of mis-trigger.
Trigger mode	AUTO	When there is no signal input, the system will automatically collect waveform data and the scan base line will be displayed on the screen. When there is signal input, the system will automatically switch to trigger scan.
	Normal	Stop collecting data when there is no trigger signal, the system will conduct trigger scan when the trigger signal generates.
	Single	The DSO will only perform 1 cycle of triggering when there is triggering signal.
Slope setting		Enter slope setting menu

Table 4-5 Slope setting menu

Function Menu	Setting	Description
Slope condition	Rising >	The DSO generates a trigger when the slew rate of rising edge of signal is higher than the specified slew rate.

	Rising <	The DSO generates a trigger when the slew rate of rising edge of signal is lower than the specified slew rate.
	Rising <>	The DSO generates a trigger when the slew rate of rising edge of signal is higher than the specified lower-limit slew rate and lower than the specified upper-limit slew rate.
	Descending >	The DSO generates a trigger when the slew rate of descending edge of signal is higher than the specified slew rate.
	Descending <	The DSO generates a trigger when the slew rate of descending edge of signal is lower than the specified slew rate.
	Descending <>	The DSO generates a trigger when the slew rate of descending edge of signal is higher than the specified lower-limit slew rate and lower than the specified upper-limit slew rate.
Time setting		The slope time is set at 20ns～10s, adjust the time through the multifunctional knob on front panel.
Threshold	High level Low level High-low level	Adjust high-level threshold of slope trigger through the LEVEL knob on trigger control area. Adjust low-level threshold of slope trigger through the LEVEL knob on trigger control area. Through the LEVEL knob on trigger control area, adjust high-level & lowl-level threshold of slope trigger at the same time.
Previous		Go to previous page

4.4 Video trigger

After the video trigger is selected, the DSO generates a trigger on the field or line of NTSC or PAL standard video signal. Trigger coupling will be preset to DC coupling. Video trigger menus are shown in the table below:

Tabel 4-6 Video trigger menu

Function Menu	**Setting**	**Description**
Type	Viedo	
Source	CH1	Set CH1 as the triggering signal source
	CH2	Set CH2 as the triggering signal source
Video Setting		Enter video setting menu

Table 4-6 Video setting menu

Function Menu	**Setting**	**Description**
Standard	PAL	Applicable to PAL video signal.

	NTSC	Applicable NTSC video signal.
Sync	All line	Set the video line to synchronous triggering.
	Line	Set the video to sync and trigger on specific line, adjust through the multifunctional knob on front panel.
	Odd field	Set the video to sync and trigger on odd field.
	Even field	Set the video to sync and trigger on even field.
Line numbers		Adjust through the multifunctional knob on front panel.
Previous		Go to previous page.

Figure 4-1 is an example screen display when PAL video trigger model is selected as standard and the synchronization mode is selected as line synchronization. Figure 4-2 is an example screen display when the synchronization mode is set to field synchronization.

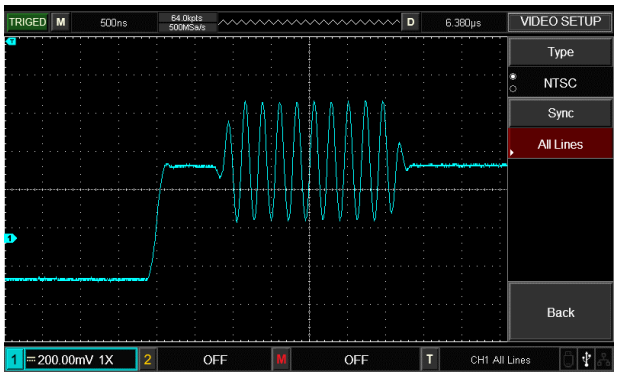


Figure 4-1 Video Trigger: Line Synchronization

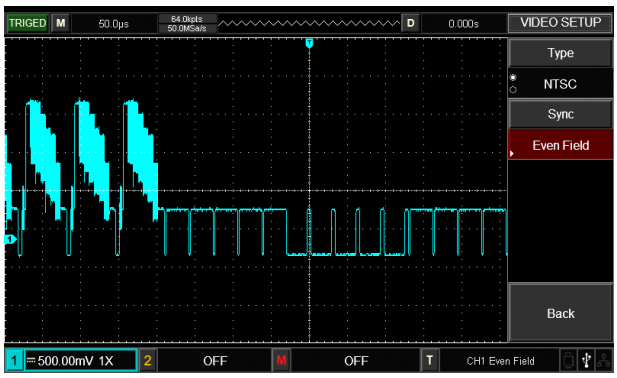


Figure 4-2 Video Trigger: Field Synchronization

4.5 Alternating trigger

During alternating trigger, the trigger signal comes from two vertical channels. Alternating trigger is useful for observing two signals with different frequency. See the figure below for display of triggered alternating waveform example and Table 4-7 for triggered alternating menu setting.

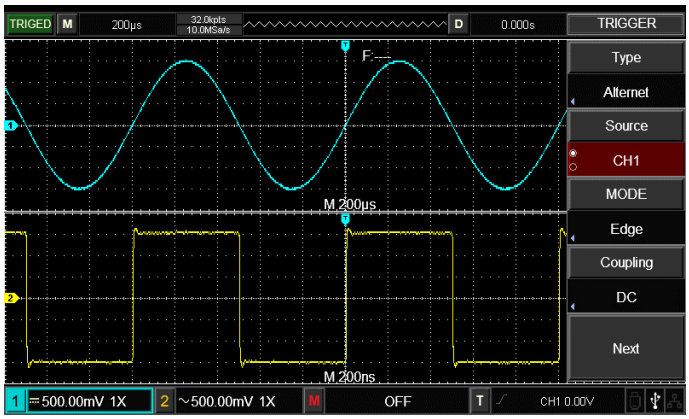


Figure 4-3 Observing Signals with Two Different Frequencies by Alternating Trigger Mode

Table 4-7 Alternating Trigger Menu (Page 1)

Function Menu	**Setting**	**Description**
Type	Alternating	
Channel selection	CH1	Select CH1 as current channel
	CH2	Select CH2 as current channel
Trigger mode	Edge	Set the edge as trigger mode
	Pulse width	Set the pulse width as trigger mode
	Slope	Set the slope as trigger mode
Coupling	DC	Pass through DC and AC components of triggering signal.
	AC	Block the DC component of triggering signal.
	HF	Reject high-frequency component of the triggering signal.
	LF	Reject low-frequency component of the triggering signal.
	Noise rejection	Suppresses high frequency noise in the signal and reduces the probability of the oscilloscope being falsely triggered .
Next page	——	Go to next page

Table 4-8 Alternating Trigger Menu (Page 2)

Function Menu	**Setting**	**Description**
Slope	Rising	Set trigger on the signal rising edge.
	Falling	Set trigger on the signal falling edge.
	Rise/fall	Set trigger on the signal both rising and falling edge.
Previous		Go to previous page.

4.6 Trigger Holdoff

Trigger holdoff time adjustment is used to observe complex waveform (pulse string series). Holdoff time refers to the waiting time for the DSO to restart trigger circuit. During holdoff time, the DSO will not trigger until the holdoff time is over.

Table 4-9 Trigger Holdoff Menu

Function Menu	Setting	Description
Window extension	On/off	Press to turn on the main time base.
Time base selection	Main time base/extensive time base	Main time base: set as main time base, the main time base will change when adjusting horizontal time base. Extension time base: set as extension time base, the extension time base will change when adjusting horizontal time base.
Window extension	——	Press to turn on the extension time base.
Hold off time		To adjust the trigger hold-off time by multi-purpose knob.

Take pulse series as example, trigger the first pulse on the pulse series, then the holdoff time can be set as pulse string width. As shown in the figure below:

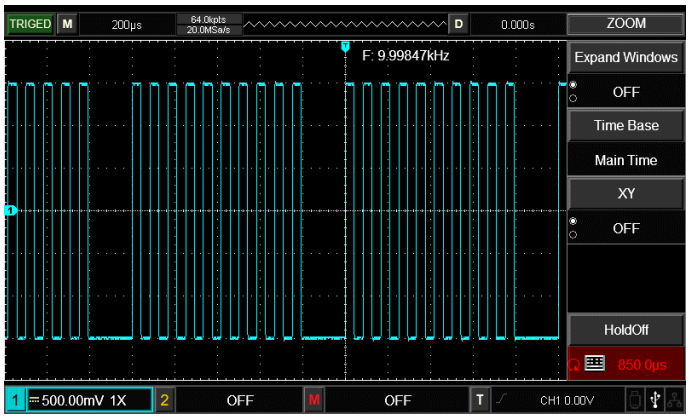


Figure 4-4 Snychronous complex waveform

Operation Instruction:

(1) Based on the synchronization mode of normal signal, select to trigger edge, trigger source, slope of TRIG MENU and adjust trigger level to make the waveform stable as possible.

(2) Press HORI MENU to display horizontal menu.

(3) By adjusting the multifunctional knob, the holdoff time will be changing until the waveform is stable.

4.7 Explanation of nouns

(1) Trigger source: Trigger can be achieved from several signal sources: input channels (CH1 and CH2), external triggers (EXT) and AC line.

■ **Input channel**: The most frequently-used trigger source is input channel (selectable). The selected channel as trigger source can operate normally no matter its input is displayed or not.

■ **External trigger**: This type of trigger source can be used not only in collecting data in two channels but also in triggering the third channel at the same time. For example, the external clock or the signal from circuit to be measured can be served as trigger source. EXT trigger source use the external trigger signal connected to EXT TRIG junction. EXT can directly use the signal, the EXT can be used when the trigger level of signal ranges from -3V to +3V.

■ **AC line trigger**: It is also called Mains supply. This can be applied to observe the signals correlated to AC line power to stabilize the synchronization, such as the relation between lighting equipment and power supply equipment.

(2) Trigger mode: Deciding the behavioral pattern of DSO under no trigger conditions. Three trigger modes are provided for DSO: auto, normal and single.

■ **Auto trigger**: When there is no trigger signal, the DSO will automatically perform data acquisition and the scan base line will be displayed on the screen. DSO will automatically synchronize with the trigger signal when there is trigger signal.

Attention: when scanning waveform is set as 100ms/div or slower time base, no trigger signal is allowed under “auto trigger” mode.

■ **Normal trigger**: Set to normal trigger mode. The DSO will only perform data acquisition only when trigger conditions are satisfied. When there is no trigger signal, DSO stops data collection. When there is trigger signal, the scan will be triggered.

■ **Single trigger**: On single trigger mode, press “Operation” once, the DSO will enter the status of waiting trigger, when the DSO detects a trigger, it will collect data and display the collected waveform, and then stop.

(3) Trigger coupling: Trigger coupling decides that what kind of signal components will be sent to trigger circuit. Coupling types include: DC, AC, low-frequency holdoff and high-frequency holdoff.

- “DC” let all components of signal pass through.
- “AC” block “DC” component and attenuate signals under 10Hz.
- “Low-frequnecy holdoff” block DC components and attenuate low-frequency components under 80kHz.
- “High-frequency holdoff” attenuate high-frequency component over 80kHz.
- “Noise holdoff” can hold off the high-frequency noise in the signal and reduce the probability of mis-trigger.

(4) Pretrigger/delay trigger

Data collected before/after the trigger. The trigger position is usually set in the horizontal center of the screen, 7div or 8div pretrigger/delay information can be viewed. If you want to view more pretrigger information, you could adjust the horizontal position of waveform by rotating horizontal position. By observing pretrigger data, you can view the waveform before triggering. For example, the glitch can be captured at the moment of starting the circuit, you can find out the cause of glitch by observing and anlyze the pretrigger data.

Chapter V Acquire System

As shown in the figure below, the ACQUIRE on the control area is the function button of Acquire System.

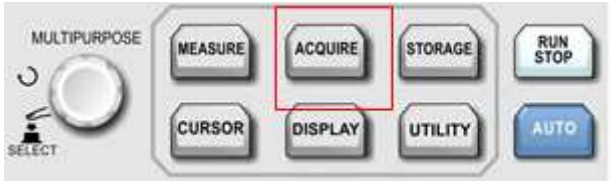


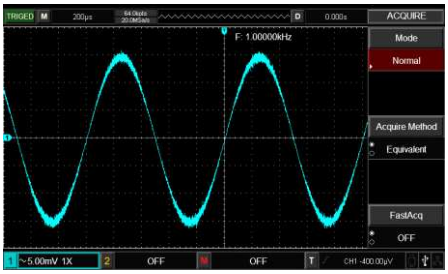
Figure 5-1 Function Key of Acquire System

Press ACQUIRE button to enter data acquisition setting menu, set the data acquisition mode through menu control button.

Table 5-1 Acquire Function Menu

Function Menu	Setting	Description
Acquisition Mode	Sampling	The DSO acquires data and reconstruct the waveform in the same time interval.
	Peak value	Set to peak value acquisition mode. The DSO finds the maximum and minimum value of input signal in each acquiring interval and uses these values to display waveform.
	High resolution	The DSO averages the proximal point of acquired waveform to reduce random noise of input signal and display a smoother wave on the screen.
	Average	The DSO acquires some waveforms and calculate their average values, and then display the final waveform.
Averages	2~256	Set average number by using the multipurpose knob, the average number is set to 2, 4, 8, 16, 32, 64,128, 256, 512
Sampling	Real-time	Set to Real-time sampling.
	Equivalence	Set to Equivalent sampling.
Fast Acq	ON	Acquire data in a way of high screen refresh rate to better reflect the dynamic effect of waveform.
	OFF	Turn off fast acquiring.

By changing the acquisition setting of the DSO, user can observe the wave change. Assuming that the noise in signal is strong, non-average acquisition method and average acquisition of 8 numbers are shown in the figure below:



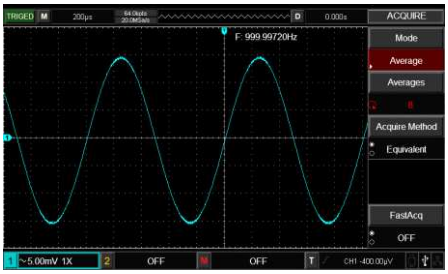


Figure 5-1 Non-average acquisition method Figure 5-2 Average acquisition of 8 numbers

Notice:

(1) Please select real-time sampling mode when observing single signal.

(2) Please select equivalent sampling mode when observing high frequency periodic signal.

(3) Please select peak detection mode when hoping to observe the signal envelope for any modulation signal. Please select average sampling mode when hoping to reduce the random noise in displayed signals, and set the average number to 2, 4, 8, 16, 32, 64,128, 256, 512.

Explanation of nouns

Sampling mode: Real-time sampling and equivalent sampling

Real-time sampling mode: Data sampling at the real-time sampling rate of the system. This is used to observe any waveform within the sampling rate of the system.

Equivalent sampling mode: Data sampling at higher than maximum sampling rate of the system. This is used to observe any periodical waveform at beyond the maximum sampling rate.

Peak value mode: DSO finds the maximum and minimum value of input signal in each sampling interval and uses these values to display waveform. In this mode, DSO can acquire and display narrow pulses, otherwise these pulses may be lost in sampling mode. The noise will be stronger in this mode.

High resolution mode: The DSO averages the proximal point of acquired waveform to reduce random noise of input signal and display a smoother wave on the screen.

Average mode: The DSO acquires some waveforms and calculate their average values, and then display the final waveform.

Chapter VI Display System

As shown in the figure below, the DISPLAY on the control area is the function button of Display System.



Figure 6-1 Function Keys of Display System

Press DISPLAY button to enter display setting menu as shown in the table below.

Table 6-1 Display Menu (Page 1)

Function	Setting	Description
Types	Vector	Display sampled points in connection way.
	Dots	Only display sampled data points.
Persistance		Set OFF, AUTO, Short persistence, Long Persistence, infinite.
Menu		Set 5s, 10s, 20s, manualy.
Screen protection time		Set OFF, 1min, 5min, 10min, 30min, 1 hour.
Next page		Go to next page

Table 6-2 Display Menu (Page 2)

Function	Setting	Description
Waveform brightness	10%-100%	Set waveform brightness
Grid brightness	10%-100%	Set grid brightness
Backlight	10%-100%	Set backlight brightness
Grid		Set full grid, lattice, cross grid, frame
Previous		Go to previous page

Key point:

Display type: The vector will fill the blank between adjacent sampled points. The Dots only displays sampled points.

Chapter VII Automatic Measurement

UTD2000 series DSO support up to 34 types of waveform measurement parameters.



Figure 7-1 Function Key of Auto Measurement

7.1 Measurement Menu

Press MEASURE to enter Measurement menu.

Table 7-1 Automatic measurement menu (Page 1)

Function Menu	Setting	Description
Main source	CH1, CH2, MATH	Select CH1 or CH2 as source.
Slave source	CH1, CH2, MATH	Select CH1 or CH2 as source.
All parameters	OFF	Close all display boxes of measurement parameters.
	ON	Pop up a display box with all measurement parameters.
Custom parameter		Pop up a selection interface with custom parameters, press the multifunctional knob to display parameters. Press custom parameter key or MENU key to close the selection interface, extremum and average value will be displayed on the screen.
Next page		Go to next page

Table 7-1 Automatic measurement menu (Page 2)

Function Menu	Setting	Description
Indication selection		By adjusting multifunctional knob, select the indicated parameter from 34 types of automatic measurement parameters.
Indicator	OFF	Turn off indicator function.
	ON	Indicate the physical significance of indicator parameters.
Clear		Clear all custom parameters.
Measurement statistics	OFF	Turn off measurement statistics function.
	ON	Turn on measurement statistics function.
Previouse page		Go to previous page.

7.2 Voltage Parameter

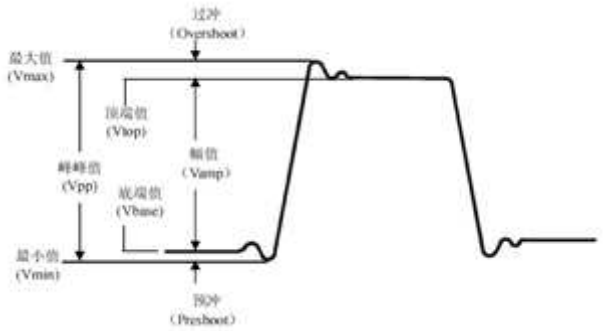


Figure 7-2 Voltage Parameter Diagram

Voltage parameters of UTD2000 series DSO include:

Max value (Max): The voltage value from waveform highest level to GND.

Min value (Min): The voltage value from waveform lowest level to GND.

Top value (High): The voltage value from waveform flat top to GND.

Bottom value (Low): The voltage value from waveform bottom to GND.

Middle value (Middle): Half of the sum value of High and Low voltage value.

Peak-peak value (Pk-Pk): The voltage value from waveform highest level to waveform lowest level.

Amplitude (Amp): The voltage value from waveform top to waveform bottom.

Mean value (Mean): The average amplitude value of waveform.

Cycle mean (CycMean): The average amplitude value of waveform of one cycle.

Root Mean Square (RMS): The effective value. The converted energy based on AC signal. The DC voltage corresponding to the generating equivalent energy, converted energy.

Cycle RMS (CycRMS): The converted energy in one cycle based on AC signal. The DC voltage corresponding to the generating equivalent energy.

7.3 Time parameter

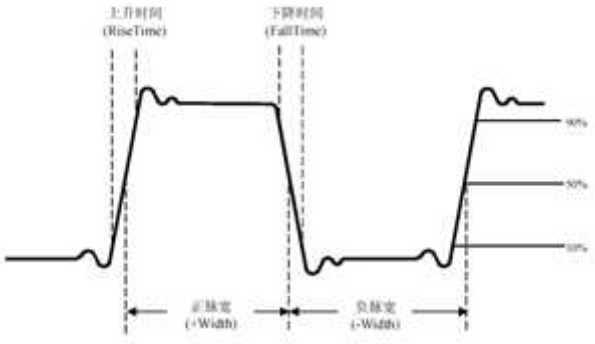


Figure 7-3 Timing Parameter Diagram

Timing parameters of UTD2000 series DSO include:

Period (Period): The time between two consecutive and same-polarity edges of repetitive waveform.

Frequency (Freq): The reciprocal of the period

Rise time (Rise): The time for waveform amplitude to rise from 10% to 90%.

Fall time (Fall): The time for waveform amplitude to fall from 90% to 10%.

Rise delay: The time for main source and slave source to delay between two rising edges

Fall delay: The time for main source and slave source to delay between two falling edges.

Positive width (+Width): The positive pulse width at 50% amplitude.

Negative width (-Width): The negative pulse width at 50% amplitude.

FRFR: The time between the first rising edge of source 1 to the first rising edge of source 2.

FRFF: The time between the first rising edge of source 1 to the first falling edge of source 2.

FFFR: The time between the the first falling edge of source 2 to the first rising edge of source 2.

FFFF: The time between the first falling edge of source 1 to the first falling edge of source 2.

FRLF: The time between the first rising edge of source 1 to the last falling edge of source 2.

FRLR: The time between the first rising edge of source 1 to the last rising edge of source 2.

FFLR: The time between the first falling edge of source 1 to the last rising edge of source 2.

FFLF: The time between the first falling edge of source 1 to the last falling edge of source 2.

7.4 Other parameters

Positive duty (+Duty): The ratio of positive pulse width and period.

Negative duty (-Duty): The ratio of negative pulse width and period.

Over shoot (OverSht): The ratio of “Difference between max value and high value” and “Amplitude value”.

Preshoot (PreSht): The ratio of “Difference between min value and low value” and “Amplitude value”.

Area: The algebraic sum of the product of voltage and time for all dots on the screen.

Cycle Area: The algebraic sum of the product of voltage and time for all dots in one cycle.

Phase: The phase difference of main source and slave source.

Chapter VIII Cursor Measurement

Use CURSOR to measure waveform X axis (time) and Y axis (voltage). Press CURSOR to enter cursor measurement menu.



Figure 8-1 Function Key of CURSOR

8.1 Cursor measurement menu

Press CURSOR to enter cursor measurement menu.

Table 8-1 cursor measurement menu

Function menu	Setting	Description
Type	OFF, time, voltage	Set measurement type
Mode	Independent mode, tracking	Select the moving mode of cursor. If independent mode is selected, only cursor 1 and cursor 2 can be moved. If tracking is selected, move cursor 1 and cursor 2 at the same time.
T unit	Second, hertz	Set the unit of time measurement
Source	CH1, CH2, Math	Set measurement source

8.2 Cursor measurement display

On CURSOR mode, user can move the cursor to measure, there are two types: voltage and time.

Rotate the Multipurpose knob to adjust the position of AY, press Multipurpose knob to shift cursor BY, adjust BY position with same way.

Set “tracking” with the mode, adajust Multipurpose knob, cursor AY and BY move in parallel.

A,B represent the voltage of coursor AY,BY

B-A represents the voltage difference between intersection of AY and waveform and intersection of BY and waveform.

When time is measured, the figure below displays on the top left of screen:

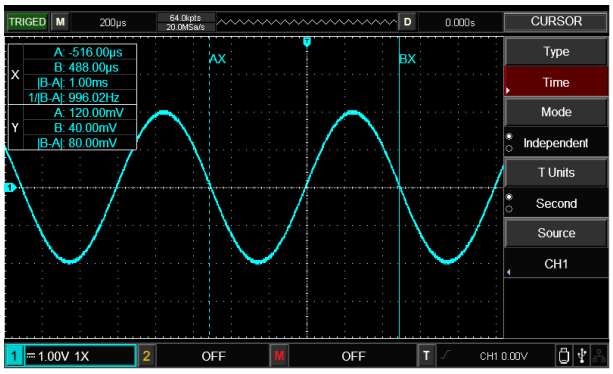


Figure 8-2 Cursor measurement for time

X time:

Rotate Multipurpose knob to adjust the position of AX, press Multipurpose knob to adjust BX, shit between BX and AX with same way.

A/B represents the time distance between zero point and the cursor A/B.

B-A represents the difference beween cursor A and cursor B.

1/|B-A| represents the reciprocal of time difference. For same periodic signal, if AX and BX locate at adjacent rising edge, 1/|B-A| equal to frequency.

Y Voltage:

A/B represents the voltage distance between zero point and the cursor A/B.

B-A represents the voltage difference beween cursor A and cursor B.

When voltage is measured, the figure bleow displays on the top left of screen:

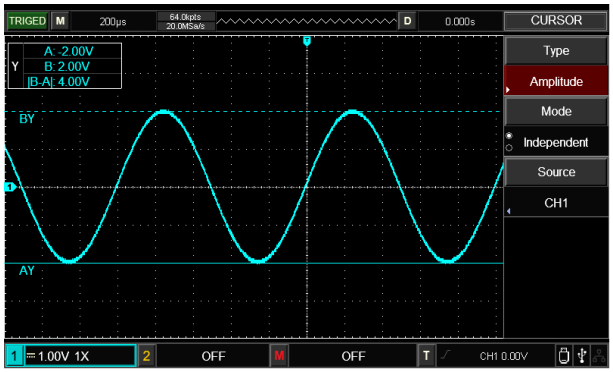


Figure 8-2 Cursor measurement for voltage

Tips: The measurement data display on the top left corner

Chapter IX Storage

The DSO setting, waveform and screen image can be store in DSO or USB, the stored setting or waveform can be recalled when needed. Press STORAGE to enter storage setting interface.



Figure 9-1 Function Key of STORAGE

9.1 Set storage and load

Press the Storage button, then Press F1 to choose storage type Setup, and you will see the following menu.

Table 9-1 Storage setting menu

Function Menu	Setting	Description
Type	Setup	Select storage type as setup.
Storgte medium	DSO, USB	Select storage location. DSO can store 20 groups, USB can sotre 200 groups.
Delete/File name		Delete: Delete the stored files. File name: The menu will change to file name when the storage medium is USB.
Save		Store the file to current designated storage location.
Load		Load the previous storage location in current designated storage location to get the DSO back to stored setting status.

■ Edit file name

When the storage medium is USB, the stored file name can be edited, press file name to enter file name edit window, as shown in the figure below:

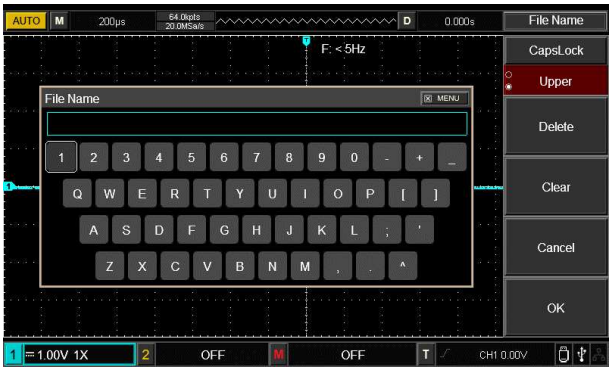


Figure 9-2 File name window

Move the cursor by adjusting multifunctional knob, press multifunctional knob switch to choose number or letter, press CONFIRM to go back to previous menu.

9.2 Waveform storage and load

Press the Storage button, then press F1 to choose storege type as Reference Waveform, and you will see the following menu.

Table 9-2 Reference waveform menu (Page 1)

Function Menu	Setting	Description
Type	Reference waveform	The selected storage type is reference waveform.
Source	REF A	Select load waveform to REF A.
	REF B	Select load waveform to REF B.
Close		Close the loaded waveform.
Storage		Enter storage menu.
Load		Enter load menu.

Table 9-3 Waveform storage menu

Function Menu	Setting	Description
Data source	CH1/CH2	Select storage channel.
Storage medium	DSO, USB	Select the set storage location.
File name	Customized	Please refer section 9.1 “Edit file name”.
Store		Press the button to store.
Previous		Go to the previous page.

Table 9-4 Waveform load menu

Function menu	Setting	Description
Reference waveform	REF A	Select load waveform to REF A.
	REF B	Select load waveform to REF B.
Storage medium		Select load location.
Load		Press the button to load.
Previous		Go to the previous page.

Function menu	Setting	Description
Type	Data file	The selected storage type is data file, stored in CSV format.
Storage medium	USB	Data file can be stored in USB only.
File name	Customized	Please refer section 9.1 “Edit file name”.

Storage		Press the button to store.

9.3 Bit map storage and load

Press the Storage button, then press F1 to choose storege type Data File, and you will see the following menu.

Table 9-6 Interface storage menu

Function Menu	Setting	Description
Type	Data file	The selected storage type is data file, stored in CSV format.
Storage medium	USB	Only when the USB is plugged into DSO can the data file be stored.
File name	Customized	Please refer section 9.1 “Edit file name”.
Save		Press the button to save.

Note: Only when the USB is plugged into DSO can the data file be stored.

9.4 Screen copy

Press PrtSc button, then current screen will be stored in USB in BMP format. This bitmap can be viewed on PC. Only when the USB is plugged into DSO can the bitmap be stored.

Chapter X Utility System

Press UTILITY to enter utility menu.



Figure 10-1 Function Key of UTILITY

Table 10-1 Utility menu (Page 1)

Function menu	Setting	Description
System Config	See chart 10-3	Enter system setup menu, the operation option include self-clibration, system information and clear information.
Language		Select interface language, different languages can be selected.
Pass/Fail	See chart 10-4	Enter pass/fail menu, please see “10.1 Pass/Fail”for specific operation.
Recorder	See chart 10-5	Enter waveform recording menu, please see 10.2 Recorder”for specific operation.
Next		Go to next page.

Table 10-2 Utility menu (Page 2)

Function menu	Setting	Description
Cymometer	OFF	Turn off frequency meter.
	ON	Turn on frequency meter.
Local square wave		It can be set as 10Hz, 100Hz, 1kHz, 10kHz, it defaults at 1kHz.
AUTO strategy		Enter AUTO strategy setting, the AUTO status can be set, please refer to “10.3 AUTO strategy”for specific operation.
LAN setup		Enter the dialog box of network setting.
Return		

Table 10-3 System setup menu (Page 3)

Function menu	Setting	Description
Self calibration	SELECT	Execute self calibration function.
	MENU	Leave self-calibration function.
System information		Display DSO system information, including Model, Hardware Version, Software Version, etc. Press MENU button to close system information.
Clear information		Clear the stored data in DSO.
Return		Go to previous menu.

10.1 Pass/Fail

Pass/Fail test: Detect whether or not the input signal is in the specified scope of template. If the input signal is within the scope, it is PASS, while if the input signal is out of the scope, it is FAIL. Pass/Fail interface on rear panel can output the Pass/Fail signal.



Pass/FailOuput interface on rear panel.

Press UTILITY button and then press F3 to enter Pass/Fail menu:

(1) Turn on operation test, press F1 to set output condition.

(2) Set the output condition, press F2 to set output condition. For fail setting, the Pass/Fail interface on rear panel will output pulse and buzz if it is FAIL. For pass setting, the Pass/Fail interface on rear panel will output pulse and buzz if it is PASS.

(3) Set the source: Enter Pass/Fail menu and then press F3 to set source.

(4) Display information: The screen displays test result.

(5) Next page.

(6) Stop setting, enter stop setting menu:

Table 10-4 Stop Setting

Function Menu	Setting	Description
Stop type	Pass times	Auto stop testing after reaching up to the PASS numbers at specified threshold.
	Fail times	Auto stop testing after reaching up to the FAIL numbers at specified threshold.
When	>=、<=	Set the stopping condition.
Threshold		Set the threshold of stopping condition through multifunctional knob.
Back		Return to previous menu (Pass/Fail Test Menu).

(7) Threshold setting, enter threshold setting menu:

Table 10-4 Stop Setting

Function Menu	Setting	Description
Reference waveform	CH1、CH2、REFA	The condition of creating template include: designated channel waveform of reference waveform, CH1 or CH2, vertical and horizontal

		tolerance.
Load		Load the reference waveform.
Horizontal tolerance	1~255	Set horizontal tolerance of template through multifunctional knob.
Vertical tolerance	1~255	Set vertical tolerance of template through multifunctional knob.
Back		Return to previous menu (Pass/Fail Test Menu).

(8) Start the test, press F1 to conduct Pass/Fail test.

10.2 Recorder

Record the current waveform frame by frame through waveform recording function.

Table 10-6 Waveform Recording Menu

Function Menu	**Setting**	**Description**
●		Record button, press this button to record, the number of recorded screen displays on the screen.
■		Stop recording
▶		1, Replay button. 2, Press this button to replay, the replayed frame number displays on the screen, rotate the multifunctional knob to stop replaying, if keep rotating the knob, a particular frame of waveform will be replayed repeatedly. 3, If users need to continue replaying all, first press ■ and then press▶. 4, Record 1000 frames of data at most.
Access		Only when the storage device is plugged in DSO can users use this function.
Return		Go to previous menu (Utility menu).

Table 10-6 Waveform Recording Access Menu

Function Menu	**Setting**	**Description**
File name		Please refer to “Edit file name”for operating method.
Save		Store the recorded waveform file in storage device.
Load		Load the recorded file in storage device to DSO.
——		Only when the USB is plugged into DSO can users use this function, enter next menu.
Reutrn		Return to previous menu.

10.3 AUTO strategy

As mentioned before, press AUTO button to activate the function of Waveform Auto Setting. To get a best diplay waveform, DSO automatically adjust vertical scale, horizontal time base and trigger mode based on input signals. This DSO allow users to set relevant parameters of auto setting function.

Table 10-7 AUTO strategy menu

Function Menu	Setting	Description
Channel setup	Release/Lock	Release: The channel setting is set as default after AUTO operation. Lock: The channel setting is unchanged after AUTO operation.
Sampling setup	Release/Lock	Release: The acquiring mode automatically changes to normal sampling after AUTO operation. Lock: The acquiring mode is unchanged after AUTO operation.
Trigger setup	Release/Lock	Release: The trigger type changes to edge after AUTO operation. Lock: The trigger type is unchanged after AUTO operation.
Signal recognition	Release/Lock	Release: Conduct AUTO operation for channels. Lock: Conduct AUTO operation only for open channels.
Return		Go to previous menu.

Chapter XI Other function botton

11.1 AUTO Setting

Based on input signals, Auto Setting selects appropriate time-based scale, Volt/Divs, trigger based to display waveform on the screen automatically. Press AUTO to enter automatic setting.

AUTO Setting is only applicable to conditions below:

1) AUTO Setting is only applicable to signals with simple and single frequency. AUTO Setting is not effective for those complicated waveform.
2) The frequency of measured signal is not less than 20Hz, and the amplitude is not less than 30mVpp.

Function	Setting
Obtainment mode	Sampling
Display format	Set to YT
Horizontal position	Auto adjustment according to signal frequency.
Second/Divs	Auto adjustment according to signal frequency.
Trigger coupling	DC
Trigger holdoff	The minimum value
Trigger level	Set to 50%
Trigger mode	AUTO
Trigger source	Set to CH1. If there is no signal for CH1 and a signal is exerted on CH2, then set to CH2.
Trigger gradient	Ascending
Trigger type	Edge
Bandwidth limit	OFF
Volt/Divs	Auto adjustment according to singnal amplitude.

NOTE: When AUTO strategy is set as default, it outpus above auto setting.

11.2 RUN/STOP

RUN/STOP button is on the front panel of DSO. When this button is pressed and a green indicator lights up, your oscilloscope is in a running status, if a red light comes on after pressing this button, it indicates the unit has stopped operation. In running status, the DSO consecutively collects waveform and the screen displays “AUTO”, while in stopping status, the DSO stops collecting waveform and the screen displays “STOP”. Press RUN/STOP to switch between stopping and running.

11.3 Help Menu

Press the HELP key to go into help menu, then press any key will display the help information of this key.

11.4 Upgrade program

The USB upgrade program makes upgrade easier and more flexible. To use this function, please follow the steps below:

(1) Download a program file to be updated from internet and store the file in USB.

(2) Turn off DSO and pulg USB into DSO, then turn on DSO.

(3) If only one program file is stored in USB, the interface will display “whether or not update”, press F3 to update. If two or more than two program files are stored in USB, the interface of selecting files will appear, press F1 to select a program file to be updated and press F3 to start updating.

(4) When the update is completed, a prompt of successful update will appear, please unplug the USB and turn off the DSO, the program update is complete when you turn on the DSO again.

NOTE:

(1) The update time is about 10 seconds.

(2) Do not turn off the DSO or unplug the USB when the program is upgrading, otherwise the upgrade will fail or unpredicted error will appear.

(3) Turn off the DSO if the upgrade is FAIL. Turn on DSO again to upgrade the program.

Chapter XII Application example

Example 1: Measuring simple signals

To observe and measure an unknown circuit signal, and to quickly display and measure the signal's frequency and peak-to-peak value.

(1) To quickly display this signal, follow the steps below：

① In the probe menu, set the attenuation factor to 10X and set the switch on the probe to 10X.

② Connect the CH1 probe to the circuitry point to be measured.

③ Press AUTO, the oscilloscope will carry out auto setup to optimise waveform display. In this status, you can further adjust the vertical and horizontal range until you get the desired waveform display.

(2) Voltage and time parameters for automatic measurement

Your oscilloscope can automatically measure most display signals. To measure signal frequency and peak-to-peak value, follow the steps below:

①. Press MEASURE to display auto measurement menu.

②. Press F4 to enter custom parameter selection window.

③. Move the slection box through multifunctional knob to peak-to- peak value and then press multifunctional knob to complete the selection of peak-to-peak parameter.

④. According to step③, move the selection box to Frequency and press multifunctional knob to complete the selection of frequency parameter measurement.

⑤. Press F4 or MENU to close custom parameter selection window.

Peak-to-peak value and frequency value display on the screen as shown in the figure below:

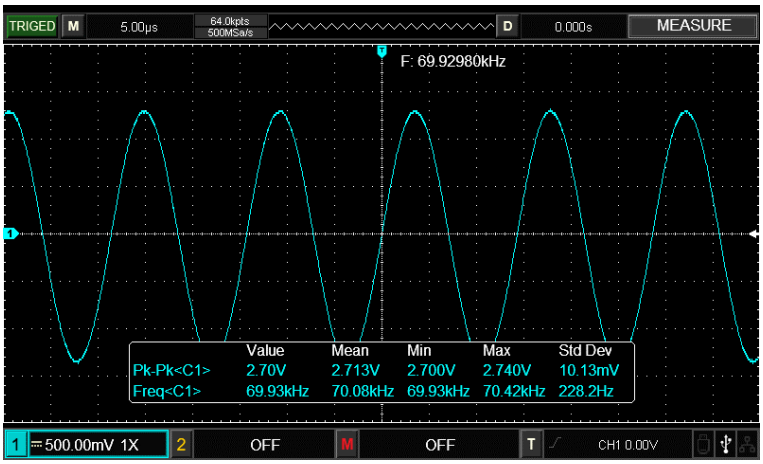


Figure 12-1 Automatic measurement

Example 2: Observing the delay caused by a sine wave signal passes through the circuit

As in the previous scenario, set the probe attenuation factor of the probe and oscilloscope channel to 10X. Connect the CH1 to the circuit signal input terminal. Connect CH2 to the output terminal.

Steps:

(1) To display CH1 and CH2 signals

① Press AUTO.

② Continue to adjust the horizontal and vertical range until you get the desired waveform display.

③ Press CH1 to select CH1. Adjust vertical position of the CH1 waveform by turning the vertical position control knob.

④ Press CH2 to select CH2. In the same way described above, adjust vertical position of the CH2 waveform so that the waveforms of CH1 and CH2 do not overlap, this will make observation easier.

2. Observing the delay caused by a sine wave signal passes through the circuit and observing waveform changes.

① When measuring channel delay automatically:

Press MEASURE to display the automatic measurement menu.

Press F1 to set main source as CH1.

Press F2 to set slave source as CH2.

Press F2 to enter custom parameter selection window, move the selection box through multifunctional knob to rising time, press multifunctional knob to complete the selection of rising delay parameter measurement.

Press F4 or MENU button to close custom parameter selection window.

Observe waveform changes (see the figure below).

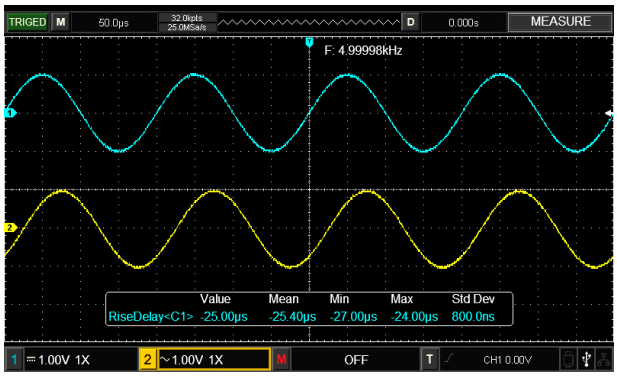


Figure 12-2 Waveform delay

Example 3: Acquiring single signal

The advantage and special feature of your digital storage Oscilloscope lie in its ability to acquire non cyclical signals like pulse and glitch. To acquire a single signal, you must have transcendental knowledge of that signal to set the trigger level and trigger edge. For example, if the pulse is a logical signal of TTL level, the trigger level should be set at about 2V and the trigger edge should be set to rising edge trigger. If you are not certain about the signal, you can observe it by automatic or normal trigger to determine the trigger level and trigger edge.

Steps:

(1) As in the previous illustration, set the attenuation factor of the probe and CH1.

(2) Carry out trigger setup

① Press TRIG MENU in the trigger control zone to display the trigger setup menu.

② In this menu, use F1~F5 set the trigger type to EDGE, set trigger source to CH1, set inclination to Rising, set trigger type to Single and set trigger coupling to AC.

③ Adjust horizontal time base and vertical range to an appropriate range.

④ Turn the TRIGGER LEVEL control knob to get the desired level.

⑤ Press RUN/STOP and wait for a signal that meets the trigger condition. If any signal reaches the set trigger level, the system will sample once and display it on the screen. By using this function you can easily acquire any occasional event. For example, when a relatively big amplitude of sudden glitch is acquired: set the trigger level to just higher than the normal signal level. Press RUN/STOP and begin waiting. When a glitch occurs, the machine will automatically trigger and record the waveform immediately before and after triggering. By turning the horizontal POSITION knob in the horizontal control zone on the front panel, you can change the trigger position horizontally to achieve negative delay trigger of various lengths for easy observation of waveform occurring before the glitch.

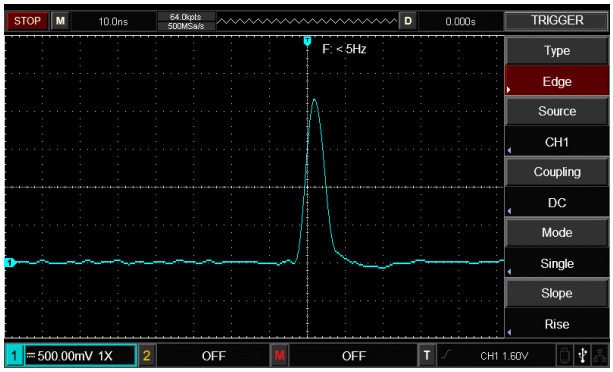


Figure 12-3 Single signal

Example 4: Reducing random noise of signals

If the signal being measured is stacked with random noise, you can adjust the setups of your oscilloscope to filter or reduce the noise, so it will not cause interference to the signal during measurement. (Waveform is shown below)

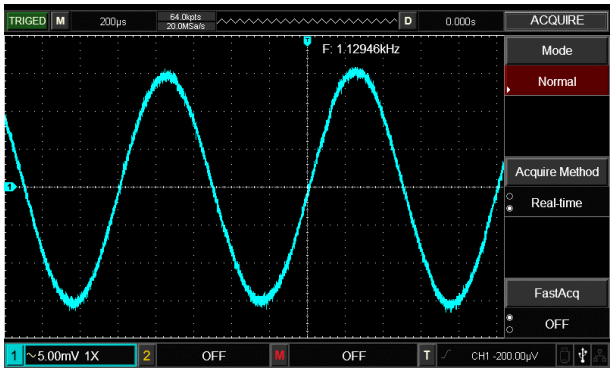


Figure 12-4 Reducing random noise of signals

Steps :

(1) As in the previous illustration, set the attenuation factor of the probe and Ch1.

(2) Connect the signal to ensure stable display of waveform.

(3) Improving trigger by setting trigger coupling.

① Press TRIG MENU in the trigger zone to display the trigger setup menu.

② Set trigger coupling to Low Frequency Holdoff or High Frequency Holdoff. Low frequency holdoff is seting up a high-pass filter. It filters low frequency signal component under 80kHz and allows high frequency signal component to pass through. High frequency holdoff is setting up a low-pass filter. It filters high frequency signal component over 80kHz and allows low frequency signal component to pass through. By setting Low Frequency Holdoff or High Frequency Holdoff, you can hold off low frequency or high frequency noise respectively and achieve a stable trigger.

(4) Reducing display noise by setting the sampling mode.

① If the signal being measured is stacked with random noise and the waveform is too coarse as a result, you can use the average sampling mode to eliminate random noise display and reduce the size of waveform for easy observation and measurement. After getting the mean, random noise is reduced and details of the signal are clearer. Follow the steps below:

Press ACQUIRE in the menu zone of the front panel to display the sampling setup menu. Press F1 to set acquisition mode to AVERAGE, then press F1 to adjust the average number of times in multiples of 2, i.e. 2 to 256, until you get the desired waveform display that meets observation and measurement requirements. (See the figure below)

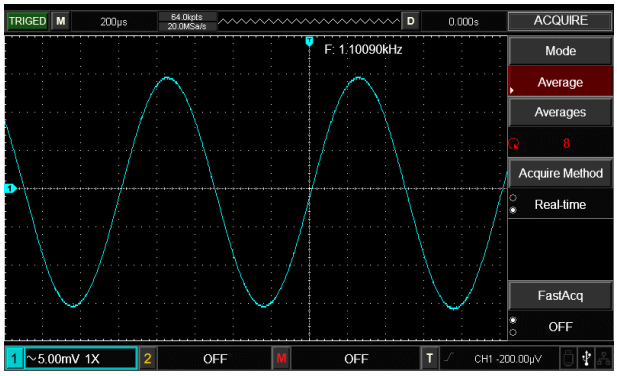


Figure 12-5 Signal noise held off

Note: In average sampling mode, the waveform display will update at a slower rate. This is normal.

Example 5: Using the cursors for measurement

Your oscilloscope can measure 28 waveform parameters automatically. All auto parameters can be measured with the cursors.

By using the cursors, you can quickly measure the time and voltage of a waveform.

Measuring one step voltage of the step signal

To measure one step voltage of the step signal, follow the steps below:

1. Press CURSOR to display the cursor measurement menu.
2. Press menu operation key F1 to set cursor type to VOLTAGE.
3. Turn the multifunction control knob to set cursor 1 at one step voltage of the step signal.
4. Press SELECT to select the cursor, then turn the multifunction control knob again to set cursor 2 at another step voltage of the step signal.

The cursor menu will automatically display the △V value, i.e. the voltage difference of that point. See the figure below.

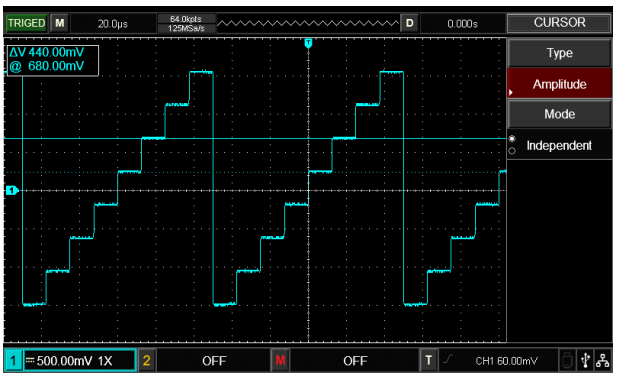


Figure 12-6 Measure the voltage difference of signals by cursors

Note: When using the cursors to measure time, follow step 2 only and set the cursor type to time.

Chapter XIII System Prompts and Trouble-shooting

13.1 Definitions of System Prompts

Adjustment at Ultimate Limit: This informs you that the multifunction control knob has reached its adjustment limit in the current status. No further adjustment is possible. When the vertical deflection factor switch, time base switch, X shift, vertical shift and trigger level adjustments have reached their ultimate limits, this prompt will appear.

USB Device Unplugged: After a USB key is unplugged from the oscilloscope, this prompt appears.

USB Screen Shot: When pressing Prtsc, this prompt appears.

USB File Save: When the oscilloscope is saving a waveform, this prompt is shown on the screen.

No signal in channel: When inputing slow signal, small signal or no signals, after conducting auto setting, this prompt appears.

13.2 Troubleshooting

(1) No waveform appears

If no waveform appears on the screen after acquiring signals, please follow the steps below to find the cause:

①. Check if the probe is connected to the signal test point correctly.

②. Check if the signal connection line is connected to the input point of analog channel.

③. Check if the input point of analog channel signal is consistent with the open channel.

④. Connect the probe tip to the compensating signal connector of DSO to check if the probe is in good condition.

⑤. Check if the thing to be measured generates signals (connect the channel with signal to the signal without signal to find the cause).

⑥. Press AUTO to recollect signals.

(2) Voltage test problem

The measured voltage amplitude is 10 times higher or lower than the actual value: check if the attenuation coefficient of channel probe is consistent with the attenuation rate of applied probe.

(3) No trigger

There is waveform display but it is not stable:

① Check the trigger Source setup in the trigger menu. See whether it is the same as the actual signal input channel.

② Check the trigger type: Use Edge trigger for ordinary signals. Stable waveform display is achieved only when the correct trigger mode is selected.

③ Try changing the trigger coupling to High Frequency Holdoff or Low Frequency Holdoff

or to filter any high or low frequency noise that is interfering with triggering.

(4) Slow refresh

①. Check if the acquiring mode in ACQUIRE button menu is average, and the average times are large.

②. If increasing the refresh speed is needed, please decrease the average times appropriately or select other acquiring modes, i.e. normal sampling.

③. Check if the persistence in DISPLAY button menu is set relatively long or infinite.

(5) The waveform is like stair-step shape.

①. Stair-step waveform is normal. The horizontal time-base scale may be is overlow, increase the horizontal time base to increase the horizontal resolutuion, which can improve the display.

②. The display type may be vector, the connecting line between sampling points may lead to a stair-step shape. Set the display type as point display to solve the problem.

Chapter XIV Technical Information

Except for those specifications marked with “Typical”, all specifications have warranties.

Unless otherwise specified, all technical specifications are applicable to the probes with attenuation switch set as 10× as well as UTD2000 series DSO. DSO must first meet the following two conditions to meet those specification standards:

- The instrument must continuously operate for over half an hour within the operating temperature.
- If the change scope of operating temperature is or exceeds 5℃, please perform the “Self-Adjustment” function in the UTILITY system function.

Acquire System Specification							
Model	UTD2052 CL+	UTD2072 CL	UTD2102CL PRO UTD2102CL+	UTD2152 CL	UTD2102 CEX+	UTD2152 CEX	UTD2202 CEX+ UTD2202 PRO
Real-time	500MS/s	500MS/s	500MS/s	500MS/s	1GS/s	1GS/s	1GS/s
Equivalence	50GS/s	50GS/s	50GS/s	50GS/s	50GS/s	50GS/s	50GS/s
Average	When the sampling times of all channels are N, N can be chosen among 2, 4, 8, 16, 32, 64, 128 and 256						

Input Channel Specifications	
Input Coupling	DC, AC and GND
Input impedance	(1MΩ± 2%)//(18pF± 3 pF)
Probe attenuation coefficient	0.01×/0.02×/0.05×/0.1×/0.2×/0.5×/1×/2×/5×/10×/20×/50×/100×/200×/500×/1000×
Maximum input voltage	400Vpk, the transient over voltage is 1000 Vpk.

Horizontal System Specification	
Time-base scale	2ns/div-50s/div
Waveform interpolation	Sin(x)/x
Time-base accuracy	≤(50+2×Service life)ppm
Record length	2×512k sampling point
Storage depth	Single channel: 64k； Double channel: 32k
Sampling rate and delay time accuracy	±50ppm (any time interval ≥1ms)

Measurement accuracy of time interval (△T) (full bandwidth)	Single time: ± (1 sampling time interval+50ppm×reading+0.6ns) >16 average values: ± (sampling time interval+50ppm×reading+0.4ns)

Vertical							
Model	UTD2052 CL+	UTD2072 CL	UTD2102PRO UTD2102CL+	UTD2152CL	UTD2102 CEX+	UTD2152 CEX	UTD2202 CEX+ UTD2202 PRO
Analog Bandwidth	50MHz	70MHz	100MHz	150MHz	100MHz	150MHz	200MHz
Rise Time(Typical)	≤7ns	≤7ns	≤3.5ns	≤2.4ns	≤3.5ns	≤2.4ns	≤1.8ns
Channels	2	2	2	2	2		2
Analog-to-digital converter (A/D)	8bit						
Deflection factor range (V/div)	1mV/div~20 V/div(at 1-2-5 increment)						
Position range	≥±8div						
Selectable bandwidth limitation (Typical)	20MHz						
Low frequency response (AC Coupling，-3dB)	≤5 Hz(above BNC)						
DC gain accuracy (sampling or average sampling mode)	5mV ~20V/div：≤±3%						
	1mV ~2mV/div：≤±4%						
DC measurement accuracy (average sampling mode)	When vertical position is 0 and N≥16: ± (4%×reading+0.1div+1mV) and selects 1mV ~2mV/div; ± (3%×reading+0.1div+1mV) and selects 10mV～20V/div;						
	When vertical position is not 0 and N≥16: ±(3%×(reading + vertical position reading) + (1%×vertical position reading)]+0.2div) The setting from 5mV/div to 200mV/div plus 2mV; the setting value from 200mV/div to 20V/div plus 50mV						
Measurement	Under the same setting and environment conditions and after averaging the captured waveforms with a						

accuracy of voltage difference (△V) (average sampling mode)	quantity of ≥16, the voltage difference (ΔV) between any two points on the waveform: ± (3%×reading+0.05div)

Trigger System Specifications	
Trigger sensitivity	≤1div
Range of trigger level	Interior：From the screen center ±10div
	EXT： ± 3V
Trigger level accuracy (Typical) applicable for the signal with rising and falling time ≥20ns	Interior：±(0.3div×V/div) (within±4 div from the screen center)
	EXT：±(6% setting value+40mV)
Pre-trigger capacity	Normal mode/scan mode, pre-trigger/delay trigger, the pre-trigger depth is adjustable.
Hold-off range	80ns~1.5s
Set the level to 50% (Typical)	Operate under the condition of input signal frequency of ≥50Hz
Trigger mode	AUTO, normal, single
High-frequency holdoff	Hold off signals over 80kHz
Low-frequency holdoff	Hold off signals below 80kHz
Edge trigger	
Edge	Rise, fall, rise&fall
Pulse width trigger	
Trigger mode	>, <, <>
Polarity	positive pulse width, negative pulse width
Pulse width range	20ns~10s
Slope trigger	
Slope condition	Positive slope (>, <, within the scope) Negative slope (>, <, within the scope)
Time setting	20ns~10s
Video trigger	
Trigger sensitivity (Typical)	2div Vpp
Signal model and line/field frequency (video trigger type)	Support standard NTSC and PAL, and the line number scope is respectively 1-525 (NTSC) and 1-625 (PAL)
Alternating trigger	
Alter	Edge, Pulse, Slope

Measurements		
Cursor	Manual mode Voltage difference between cursors (△V), Time difference between cursors (△T), Reciprocal of △T (Hz) (1/△T))	
	Track mode	Voltage value and time value of point of waveform.
	Auto measurement mode	Cursor display is allowed on auto measurement mode.
Automatic measurement	Vpp, Vamp, Vmax, Vmin, Vtop, Vbase, Vmid, Average, Vrms, Overshoot, Preshoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, +Duty, -Duty, Delay, FRFR, FRFF, FFFR, FFFF, FRLF, FRLR, FFLR, FFLF	
Measurement quantity	Display 5 types of measurement at the same time.	
Measurement scope	Screen or cursor	
Measurement statistics	Average value, maximum value, minimum value and standard deviation.	

Math	
Math operation	+, -, ×, ÷
Window	Rectangle, Hanning、Blackman、Hamming
Vertical scale	Vrms、dBVrms
Digital filtering	Low pass, high pass, band pass, band reject

Storage	
Setting	Internal: 20 groups. USB: 200 groups
Reference waveform	Internal: 20 groups. USB: 200 groups
Data file	Internal: 20 groups. USB: 200 groups
Bitmap	USB: 200 groups, in BMP format.

Trigger frequency meter	
Reading resolution	6 bits
Trigger sensitivity	≤30Vrms
Accuracy (Typical)	±51ppm (+1 character)

Display	
Displays types	LCD with Diagonal of 178mm (7-inch)
Display resolution	800 horizontal×RGB× 480 vertical pixels
Display color	Color
Waveform luminance	Adjustable
Backlight intensity (Typical)	300nit
Language	Chinese and English

Interface function:	
Standard configuration	Standard：USB-Host, USB-Device, EXT Trig, Pass/Failt. Option：Multimeter module (UT-M12), LAN.

General Technical Specification	
Probe compensator output	
Output voltage (Typical)	About 3Vpp, when the load≥1MΩ
Frequency (Typical)	10Hz,100Hz, 1kHz(Default), 10kHz
Power Source	
Power voltage	100V-240V~(Fluctuations±10%)，50/60Hz
Power consumption	100VA max
Fuse	F 1.6A, 250V
Environment Specifications	
Intended use	Indoor use
Pollution degree	2
Operating temperature	Operating Temperature Range: 0℃~+40℃
Storage Temperature	Storage Temperature Range: -20℃~+60℃
Cooling	Build-in cooling fan
Operating Humidity Range	<35℃: ≤90%RH 35℃~40℃: ≤60%RH
Operating Altitude	Operating：2000 meters below Non-operating：15000 meters below
Mechanical specifications	
Size	306mm(W)×138mm(H)×124mm(D)
Weight	Excluding package：2.5kg Including package：3kg
Recommended calibration Interval	
The recommended calibration interval is one year.	

Chapter XV Appendix

Appendix A Accessories

Model	UTD2052CL+ (50 MHz)
	UTD2072CL (70 MHz)
	UTD2102CL+ (100 MHz)
	UTD2102CL PRO (100 MHz)
	UTD2152CL (150 MHz)
	UTD2102CEX+ (100 MHz)
	UTD2152CEX (150 MHz)
	UTD2202 PRO(200 MHz)
	UTD2202CEX+ (200 MHz)
Standard accessories	A string of power cord complying with country standard.
	A string of USB cable (UT-D14)
	A pair of passive probe (50MHz) /(150MHz) /(200MHz)
Optional accessories	Multimeter module (UT-M12)

Appendix B Maintenance and Cleaning

(1) General Maintenance

Please do not store or place the instrument at any places where the LCD of the instrument is exposed to sunlight directly.

Caution: Please do not stain the instrument or probe with spray, liquid or solvent, so as to avoid damaging the instrument or probe.

(2) Clearing

Check the instrument and probe frequently. Clean the surface of the instrument according to the following steps:

① Please wipe the surface of the instrument and probe with soft cloth. Pay attention not to scratch the LCD screen.

② Wipe the instrument with wet cloth after disconnecting the power supply. Use detergent or clear water to clean. Do not use any abrasive chemical cleaning agent so as to avoid damaging the instrument or probe.

Warnings: Please make sure that the instrument is completely dry before powering on again, to avoid electrical short circuit or injury.

Appendix C Warranty

UNI-T (Uni-Trend Technology (China) Co., Ltd.) warrants that product produced and marketed by it will be free from defects in materials and workmanship for a period of three

years from the date of shipment by the authorized dealer. If any such product proves defective during this warranty period, UNI-T will repair the defective product or provide a replacement according to specific terms and conditions of the warranty. To request maintenance and repair service or a full copy of the warranty, please contact your nearest UNI-T sales and maintenance office.

Save and except the guarantee given herein or in other applicable warranty, UNI-T makes no other express or implied guarantee, including but not limited to any implied guarantee on the product's tradability and suitability for any specific purpose. Under no circumstance will UNI-T bear any liability for any indirect, special or subsequent loss.

Appendix D Contact Us

For product support outside China, contact your local UNI-T supplier or sales centre.

Service Support: Many UNI-T products offer optional plans of extended warranty period or calibration period. For details please contact your local UNI-T supplier or sales centre.

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